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VISIBILITY TIME SERIES FOR KEY STATIONS

ORIGINAL

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WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS

June 1981

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NARRATIVE

INTRODUCTION

Special studies were performed on the data from 51 selected stations to judge how well 3-hourly observations represent the atmospheric conditions described by hourly observations and to investigate visibility trends. These stations were chosen to reflect both local and regional climates throughout the United States. The availability of data for a long and continuous time period was a key factor in the station selection. Figure 1 shows the locations of the 51 stations.

The adequacy of 3-hourly observations in representing the climate is important for interpreting the information in Volumes I through X and in the visibility time series presented in this volume. Inadequate representations could lead to a description of the climate for a station that is different from the true climate. Resulting operational decisions may be improper and costly.

The visibility time series indicate climatic variability. Changing conditions can be caused by differences in observing practices, by variations in the natural climate and/or by the increase or decrease of air pollution. While definitive predictions should not be made of future trends, the past record shown in the time series could provide a guide to future visibility patterns.

DATA

The time series graphs presented in this volume are based on all visibilities (both day and night) for each year observed at 3-hourly intervals. Although visibilities are actually observed hourly at the weather stations, the data for most stations on magnetic tape at the National Climatic Center include only the 3-hourly observations from 1965 onward.

Meteorological experience indicates that a 3-hourly observation of ceiling, visibility or wind may not represent the prevailing atmospheric conditions during the 3 hour time segment. The following two examples illustrate the problems that may occur.

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FIGURE 1. Key Station Locator Map

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In late summer dense fog is common for a few hours around sunrise in the southeastern United States. If the weather is recorded shortly before the fog forms or shortly after the fog lifts, the observation will not represent the fog conditions that exist over a significant part of the 3-hourly interval. Observations recorded once an hour would record some of the fog that is missed by the 3-hourly record.

At many coastal locations a land-sea breeze is common. During the afternoon, the wind blows onshore, and convective clouds form over land. In late evening the wind blows offshore, convective clouds dissipate over land and form over water. The true time of the reversal of the wind flow and of the cloud development or dissipation is often missed if observations are recorded at 3-hourly intervals. A climatology built on 3-hourly observations may lead to erroneous conclusions.

To test whether 3-hourly observations compare favorably with hourly observations, the Kolmogorov-Smirnov two sample, two-tailed test with a significance level of .05 was used. This nonparametric statistical procedure tests the null hypothesis that two independent samples come from the same population or populations with the same distribution. It is based only on the maximum absolute difference between two cumulative step functions and is sensitive to both positive and negative differences. If the maximum absolute difference is greater than a calculated theoretical critical value then it is concluded with reasonable certainty that the two samples have statistically different distributions. As applied to this study, this conclusion means that in a statistical sense 3-hourly observations do not represent the same atmospheric conditions as the hourly observations.

The Kolmogorov-Smirnov test was performed for ceiling-visibility classes 1, 3-6 presented in Volumes I through X for selected key stations. Using only the years of record for which hourly observations are available on magnetic tape, the wind speed and direction distributions of the hourly data for a given day-night, ceiling-visibility class were compared with the corresponding 3-hourly distributions. Comparisons were also made for ceiling-visibility data irrespective of wind. The test was performed for data summarized monthly and annually.

Table 1 shows the test results for annual data. The distributions of hourly vs. 3-hourly observations differ statistically in 18 cases. The test compares two distributions in a cumulative sense, i.e., all wind speeds less than 4 mph then all speeds less than 13 mph, etc., or all directions from the north then all directions from the north and north-northeast, etc. Since small differences between the hourly and 3-hourly observations in a given speed group or direction are additive, the accumulated differences may be statistically significant but not operationally significant if the concern is about the comparison within a specified speed group or direction.

Tables 2-19 present detailed comparisons of the hourly and 3-hourly distributions for the 18 cases for which hourly and 3-hourly data differed. The percentage differences for individual groups or directions (line E) are less than or equal to one in 15 cases and less than two in the remaining three cases. Operationally, these small differences are probably insignificant.

At is concluded that 3-hourly observations adequately represent the climatology described by the hourly observations if the data are summarized annually. On a monthly basis, however, this conclusion may be invalid for many locations because seasonal and diurnal climatic variability become more significant as the time period over which data are summarized is shortened.

TIME SERIES

Two sets of visibility time series for selected stations are presented. Appendix A shows percentages of reduced visibility observations (visibilities less than 7 miles) having values in four ranges. Appendix B shows percentages of the same four ranges for all observations (visibilities from zero to infinity). The four visibility categories are: (1) less than 7 miles but greater than or equal to 3 miles; (2) less than 3 miles; (3) less than 3 miles but greater than or equal to 1 mile; and, (4) less than 1 mile.

In each appendix two graphs are shown for each station. The first graph considers visibilities reduced by any weather phenomenon (categories A-D), and the second graph considers visibilities reduced by fog, smoke or haze (categories E-H). The difference between the two graphs reflects

Table 1. Summary of Annual Kolmogorov-Smirnov Test Results

Time:	DAY												NIGHT											
Constraint:	CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS		CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS	
Distribution:	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV		WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV	
NEW ENGLAND																								
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CV = ceiling-visibility WD = wind direction WS = wind speed

. = statistically, 3-hourly observations represent hourly observations

• = statistically, 3-hourly observations do not represent hourly observations

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Table 1. Summary of Annual Kolmogorov–Smirnov Test Results (con.)

Time:	DAY											NIGHT										
Constraint:	CV–1		CV–3		CV–4		CV–5		CV–6		ALL WINDS	CV–1		CV–3		CV–4		CV–5		CV–6		ALL WINDS
Distribution:	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV
GREAT LAKES																						
MDW	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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* = statistically, 3-hourly observations do not represent hourly observations

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Table 1. Summary of Annual Kolmogorov-Smirnov Test Results (con.)

Time:	DAY												NIGHT											
Constraint:	CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS		CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS	
Distribution:	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV		WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV	
ROCKY MOUNTAIN																								
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. = statistically, 3-hourly observations represent hourly observations

• = statistically, 3-hourly observations do not represent hourly observations

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Table 1. Summary of Annual Kolmogorov-Smirnov Test Results (con.)

Time:	DAY											NIGHT										
Constraint:	CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS	CV-1		CV-3		CV-4		CV-5		CV-6		ALL WINDS
Distribution:	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV	WD	WS	WD	WS	WD	WS	WD	WS	WD	WS	CV
ALASKAN																						
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CV = ceiling-visibility WD = wind direction WS = wind speed

. = statistically, 3-hourly observations represent hourly observations

* = statistically, 3-hourly observations do not represent hourly observations

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Table 2. CON CONCORD, NH Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	17638	38149	7857	3990	1645	310	15	69604
B	25.3	54.8	11.3	5.7	2.4	.5	.0	
C	6389	13163	2557	1338	546	115	8	24116
D	26.5	54.6	10.6	5.6	2.3	.5	.0	
E	-1.2	.2	.7	.1	.1	.0	.0	
F	-1.2*	- .9	- .2	- .1	.0	.0	.0	

Table 3. PBI WEST PALM BEACH, FL Wind Direction Distribution for Ceiling-Visibility Class 1/ Day

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	3064	2817	5118	7580	9415	9444	9345	7195	3754	2709	2878	2367	2405	3243	4375	3715	2559	81983
B	3.7	3.4	6.2	9.3	11.5	11.5	11.4	8.8	4.6	3.3	3.5	2.9	2.9	4.0	5.3	4.5	3.1	
C	995	884	1705	2597	3161	3269	3216	2407	1324	934	1012	826	843	1090	1613	1340	997	28193
D	3.5	3.1	6.1	9.2	11.2	11.6	11.4	8.5	4.7	3.3	3.6	2.9	3.0	3.9	5.7	4.8	3.5	
E	.2	.3	.1	.1	.3	- .1	.0	.3	- .1	.0	- .1	.0	- .1	.1	- .4	- .3	- .4	
F	.2	.5	.7	.7	1.0*	.9	.9	1.2*	1.1*	1.0*	1.0*	.9	.9	1.0	.6	.3	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

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Table 4. PBI WEST PALM BEACH, FL Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	6437	43277	16600	9391	5332	893	53	81983
B	7.9	52.8	20.3	11.5	6.5	1.1	.1	
C	2420	14957	5516	3190	1787	302	21	28193
D	8.6	53.1	19.6	11.3	6.3	1.1	.1	
E	- .7	- .3	.7	.2	.2	.0	.0	
F	- .7	-1.1*	- .3	- .2	.0	.0	.0	

Table 5. ABQ ALBUQUERQUE, NM Wind Speed Distribution for Ceiling-Visibility Class 1/ Night

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	16397	55096	6452	4049	3314	1081	219	86608
B	18.9	63.6	7.5	4.7	3.8	1.3	.3	
C	5219	18539	2291	1436	1161	369	79	29094
D	17.9	63.7	7.9	4.9	4.0	1.3	.3	
E	1.0	- .1	- .4	- .2	- .2	.0	.0	
F	1.0*	.9	.5	.2	.0	.0	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

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Table 6. BRO BROWNSVILLE, TX Wind Direction Distribution for Ceiling-Visibility Class 1/ Day

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	3223	2543	3746	3111	4907	8491	17975	15197	6700	1314	668	487	532	867	2682	4042	885	77370
B	4.2	3.3	4.8	4.0	6.3	11.0	23.2	19.6	8.7	1.7	.9	.6	.7	1.1	3.5	5.2	1.1	
C	1110	917	1325	1129	1775	3048	6290	5357	2270	435	189	157	179	263	836	1323	347	26950
D	4.1	3.4	4.9	4.2	6.6	11.3	23.3	19.9	8.4	1.6	.7	.6	.7	1.0	3.1	4.9	1.3	
E	.1	- .1	- .1	- .2	- .3	- .3	- .1	- .3	.3	.1	.2	.0	.0	.1	.4	.3	- .2	
F	.1	- .1	- .1	- .3	- .6	- .9	-1.0*	-1.2*	-1.0*	- .9	- .8	- .7	- .7	- .5	- .2	.1	.0	

Table 7. BRO BROWNSVILLE, TX Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	4020	23188	13453	17779	15425	3368	137	77370
B	5.2	30.0	17.4	23.0	19.9	4.4	.2	
C	1545	8318	4550	6052	5319	1122	44	26950
D	5.7	30.9	16.9	22.5	19.7	4.2	.2	
E	- .5	- .9	.5	.5	.2	.2	.0	
F	- .5	-1.4*	- .9	- .4	- .2	.0	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

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Table 8. BRO BROWNSVILLE, TX Wind Direction Distribution for Ceiling-Visibility Class 1/ Night

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	2677	1369	1822	1995	3360	7457	15129	11087	3783	812	645	512	575	841	3319	3723	2464	61570
B	4.4	2.2	3.0	3.2	5.5	12.1	24.6	18.1	6.1	1.3	1.1	.8	.9	1.4	5.4	6.1	4.0	
C	835	421	533	596	966	2344	4683	3452	1228	264	215	177	202	293	1122	1287	768	19386
D	4.3	2.2	2.8	3.1	5.0	12.1	24.2	17.8	6.3	1.4	1.1	.9	1.0	1.5	5.8	6.6	4.0	
E	.1	.0	.2	.1	.5	.0	.4	.3	- .2	- .1	.0	- .1	- .1	- .1	- .4	- .5	.0	
F	.1	.1	.3	.5	.9	1.0	1.4*	1.6*	1.4*	1.4*	1.3*	1.2*	1.1	1.0	.6	.0	.0	

Table 9. SLE SALEM, OR Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	14166	48755	9025	4047	1890	348	49	78307
B	18.1	62.3	11.5	5.2	2.4	.4	.1	
C	4342	16012	3018	1328	595	116	16	25427
D	17.1	63.0	11.9	5.2	-2.3	.5	.1	
E	1.0	- .7	- .4	.0	.1	- .1	.0	
F	1.0*	3	.0	.0	.0	.0	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

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Table 10. YUM YUMA, AZ Wind Direction Distribution for Ceiling-Visibility Class 1/ Day

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	7823	6380	3270	1529	1320	992	3789	6133	6810	4488	5279	5391	6062	4897	3002	4355	4225	75745
B	10.3	8.4	4.3	2.0	1.7	1.3	5.0	8.1	9.0	5.9	7.0	7.1	8.0	6.5	4.0	5.8	5.6	
C	2607	2230	1032	479	448	297	1145	1901	2141	1426	1688	1715	1863	1562	970	1392	1201	24097
D	10.8	9.3	4.3	2.0	1.9	1.2	4.8	7.9	8.9	5.9	7.0	7.1	7.7	6.5	4.0	5.8	5.0	
E	- .5	- .9	.0	.0	- .2	.1	.2	.2	.1	.0	.0	.0	.3	.0	.0	.0	.6	
F	- .5	-1.3*	-1.3*	-1.3*	-1.4*	-1.3*	-1.1*	- .8	- .7	- .7	- .8	- .8	- .5	- .5	- .6	- .6	.0	

Table 11. YUM YUMA, AZ Wind Direction Distribution for Ceiling-Visibility Class 1/ Night

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	5291	4427	2349	1342	1553	1385	4826	5891	4344	2465	2894	2607	4009	4900	3152	2904	9226	63565
B	8.3	7.0	3.7	2.1	2.4	2.2	7.6	9.3	6.8	3.9	4.6	4.1	6.3	7.7	5.0	4.6	14.5	
C	1739	1454	784	481	553	503	1775	2110	1506	875	1058	956	1496	1748	1120	967	3208	22333
D	7.8	6.5	3.5	2.2	2.5	2.3	8.0	9.5	6.7	3.9	4.7	4.3	6.7	7.8	5.0	4.3	14.4	
E	.5	.5	.2	- .1	- .1	- .1	- .4	- .2	.1	.0	- .1	- .2	- .4	- .1	.0	.3	.1	
F	.5	1.0	1.2*	1.1*	1.1*	1.0	.7	.5	.6	.5	.4	.2	- .2	- .3	- .4	- .2	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

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Table 12. LAX LOS ANGELES, CA Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	12911	73241	21187	6222	1924	467	66	116018
B	11.1	63.1	18.3	5.4	1.7	.4	.1	
C	3901	24411	7089	2043	623	146	26	38239
D	10.2	63.8	18.5	5.3	1.6	.4	.1	
E	.9	- .7	- .2	.1	.1	.0	.0	
F	.9*	.2	- .1	.0	.0	.0	.0	

Table 13. LAX LOS ANGELES, CA Wind Speed Distribution for Ceiling-Visibility Class 3/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	7087	18444	2491	433	103	30	0	28588
B	24.8	64.5	8.7	1.5	.4	.1	.0	
C	2129	6186	810	139	40	9	0	9313
D	22.9	66.4	8.7	1.5	.4	.1	.0	
E	1.9	-1.9	.0	.0	.0	.0	.0	
F	1.9*	.0	.0	.1	.0	.0	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

Table 14. LAX LOS ANGELES, CA Wind Direction Distribution for Ceiling-Visibility Class 1/ Night

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	4758	3771	5290	6071	10264	5207	3396	2227	3035	2098	4307	10456	12625	3317	2553	3054	8815	91244
B	5.2	4.1	5.8	6.7	11.3	5.7	3.7	2.4	3.3	2.3	4.7	11.5	13.8	3.6	2.8	3.4	9.7	
C	1584	1210	1638	2005	3473	1755	1168	739	1021	691	1441	3549	4362	1145	878	1053	3121	30833
D	5.1	3.9	5.3	6.5	11.3	5.7	3.8	2.4	3.3	2.2	4.7	11.5	14.2	3.7	2.9	3.4	10.1	
E	.1	2	.5	.2	.0	.0	- .1	.0	.0	.1	.0	.0	- .4	- .1	- .1	.0	- .4	
F	.1	.3	.8	.9*	.9*	.9*	.9	.9*	.9*	1.0*	1.0*	1.0*	.7	.6	.5	.5	.0	

Table 15. SAC SACRAMENTO, CA Wind Direction Distribution for Ceiling-Visibility Class 1/ Day

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	3437	806	943	380	891	1099	4134	4492	6674	9821	14964	3780	2936	2743	6388	7240	3704	74432
B	4.6	1.1	1.3	.5	1.2	1.5	5.6	6.0	9.0	13.2	20.1	5.1	3.9	3.7	8.6	9.7	5.0	
C	1150	282	310	137	277	365	1230	1415	2083	3380	5167	1306	961	894	2122	2454	1203	24736
D	4.7	1.1	1.3	.6	1.1	1.5	5.0	5.7	8.4	13.7	20.9	5.3	3.9	3.6	8.6	9.9	4.9	
E	- .1	.0	.0	- .1	.1	.1	.6	.3	.6	- .5	- .8	- .2	.0	.1	.0	- .2	.1	
F	- .1	- .1	- .1	- .1	.0	.0	.5	.9	1.4*	.9	.2	- .1	.0	.1	.1	- .1	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

Table 16. SFO SAN FRANCISCO, CA Wind Direction Distribution for Ceiling-Visibility Class 1/ Night

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	1181	662	621	690	803	1224	2787	2502	3737	2696	3286	4088	11018	18496	9491	1322	6921	71525
B	1.7	.9	.9	1.0	1.1	1.7	3.9	3.5	5.2	3.8	4.6	5.7	15.4	25.9	13.3	1.9	9.7	
C	380	204	190	226	269	380	890	792	1206	830	1037	1349	3739	6309	3216	441	2302	23760
D	1.6	.9	.8	1.0	1.1	1.6	3.8	3.3	5.1	3.5	4.4	5.7	15.7	26.6	13.5	1.9	9.7	
E	.1	.0	.1	.0	.0	.1	.1	.2	.1	.3	.2	.0	- .3	- .7	- .2	.0	.0	
F	.1	.1	.2	.2	.2	.3	.5	.6	.8	1.0*	1.3*	1.3*	1.0	.3	.0	.0	.0	

Table 17. SFO SAN FRANCISCO, CA Wind Direction Distribution for Ceiling-Visibility Class 3/ Night

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	204	174	192	170	217	241	376	294	446	414	626	1487	4035	2848	805	106	773	13408
B	1.5	1.3	1.4	1.3	1.6	1.8	2.8	2.2	3.3	3.1	4.7	11.1	30.1	21.2	6.0	.8	5.8	
C	53	55	59	54	61	60	122	94	148	135	201	521	1449	1018	268	47	253	4598
D	1.2	1.2	1.3	1.2	1.3	1.3	2.7	2.0	3.2	2.9	4.4	11.3	31.5	22.1	5.8	1.0	5.5	
E	.3	.1	.1	.1	.3	.5	.1	.2	.1	.2	.3	- .2	-1.4	- .9	.2	- .2	.3	
F	.3	.5	.6	.7	1.0	1.5	1.7	1.8	1.9	2.1	2.4*	2.1	.7	- .2	.0	- .3	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3-hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

Table 18. ITO HILO, HI Wind Direction Distribution for Ceiling-Visibility Class 1/ Day

	DIRECTION																TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
A	6770	5536	7164	6022	6696	5484	3604	1889	2178	2153	4023	4897	3850	1726	1931	2335	2529	68787
B	9.8	8.1	10.4	8.8	9.7	8.0	5.2	2.8	3.2	3.1	5.9	7.1	5.6	2.5	2.8	3.4	3.7	
C	2268	1794	2375	1905	2194	1782	1210	591	676	598	840	1135	1125	515	632	730	784	21154
D	10.7	8.5	11.2	9.0	10.4	8.4	5.7	2.8	3.2	2.8	4.0	5.4	5.3	2.4	3.0	3.5	3.7	
E	- .9	- .4	- .8	- .2	- .7	- .4	- .5	.0	.0	.3	1.9	1.7	.3	.1	- .2	- .1	.0	
F	- .9	-1.3*	-2.1*	-2.4*	-3.0*	-3.5*	-3.9*	-4.0*	-4.0*	-3.7*	-1.8*	- .1	.2	.3	.1	.0	.0	

Table 19. ITO HILO, HI Wind Speed Distribution for Ceiling-Visibility Class 1/ Day

	SPEED GROUP (MPH)							TOTAL
	0-3	4-12	13-15	16-18	19-24	25-31	32+	
A	10271	45336	8782	3163	1063	161	11	68787
B	14.9	65.9	12.8	4.6	1.6	.2	.0	
C	3063	13732	2904	1051	346	55	3	21154
D	14.5	64.9	13.7	5.0	1.6	.3	.0	
E	.4	1.0	- .9	- .4	.0	- .1	.0	
F	.4	1.5*	.5	.1	.0	.0	.0	

A = Number of hourly observations
B = Percentage of total number of observations for given speed group or direction
C = Number of 3-hourly observations
D = Percentage of total number of 3-hourly observations for given speed group or direction
E = Percentage difference between hourly and 3 hourly observations for given speed group or direction
F = Cumulative percentage difference between hourly and 3-hourly observations
* = Difference greater than critical value for Kolmogorov-Smirnov test

visibilities that are reduced by precipitation, dust, blowing snow, etc. which do not occur simultaneously with fog, smoke or haze. For example, if rain and fog simultaneously reduce visibility, the restriction would be counted in graphs 1 and 2. When just rain is observed, only graph 1, and not graph 2, would receive the count.

The difference between Appendix A and B is the divisor for computing yearly percentages. The divisor in Appendix A is the number of 3-hourly visibility observations that are less than 7 miles and changes from year to year. Therefore, the sum of categories A and E is 100 percent when all restrictions are considered. When only fog, smoke or haze is considered (categories E and F), the sum will be less than or equal to 100 percent. The sum of categories C and D (G and H) equals the percentage shown for category B (F). The divisor in Appendix B is the total number of 3-hourly visibility observations in a year and is generally 2,920 (eight observations per day times 365 days in a year). The sum of categories A and B (E and F) does not necessarily equal 100 percent, but the sum of categories C and D (G and H) does equal the percentage shown for category B (F). Figures 2-5 show the legend for the time series as well as sample computations.

The two graphs in Appendix A show relative climatic variations between individual categories when visibility is restricted. For example, if the ratio of the number of all visibilities less than 3 miles (category B) to the number of visibilities less than 7 miles were to decrease by 10 percent between 1948-1978, then a corresponding increase of 10 percent would occur in category A. Appendix A does not portray overall climatic changes in visibility. Changes in the climatology of visibilities less than 7 miles can be inferred from Appendix B, since the percentages are based on all visibilities and not just those less than 7 miles.

Comparison of the two graphs in each appendix for a particular station can also show a change in visibility. As stated earlier, the difference between the two graphs reflects the visibilities reduced by precipitation, dust, etc. If this difference is not constant, then some climatic variation has occurred in the weather phenomena other than fog, smoke and haze.

There are three major reasons for

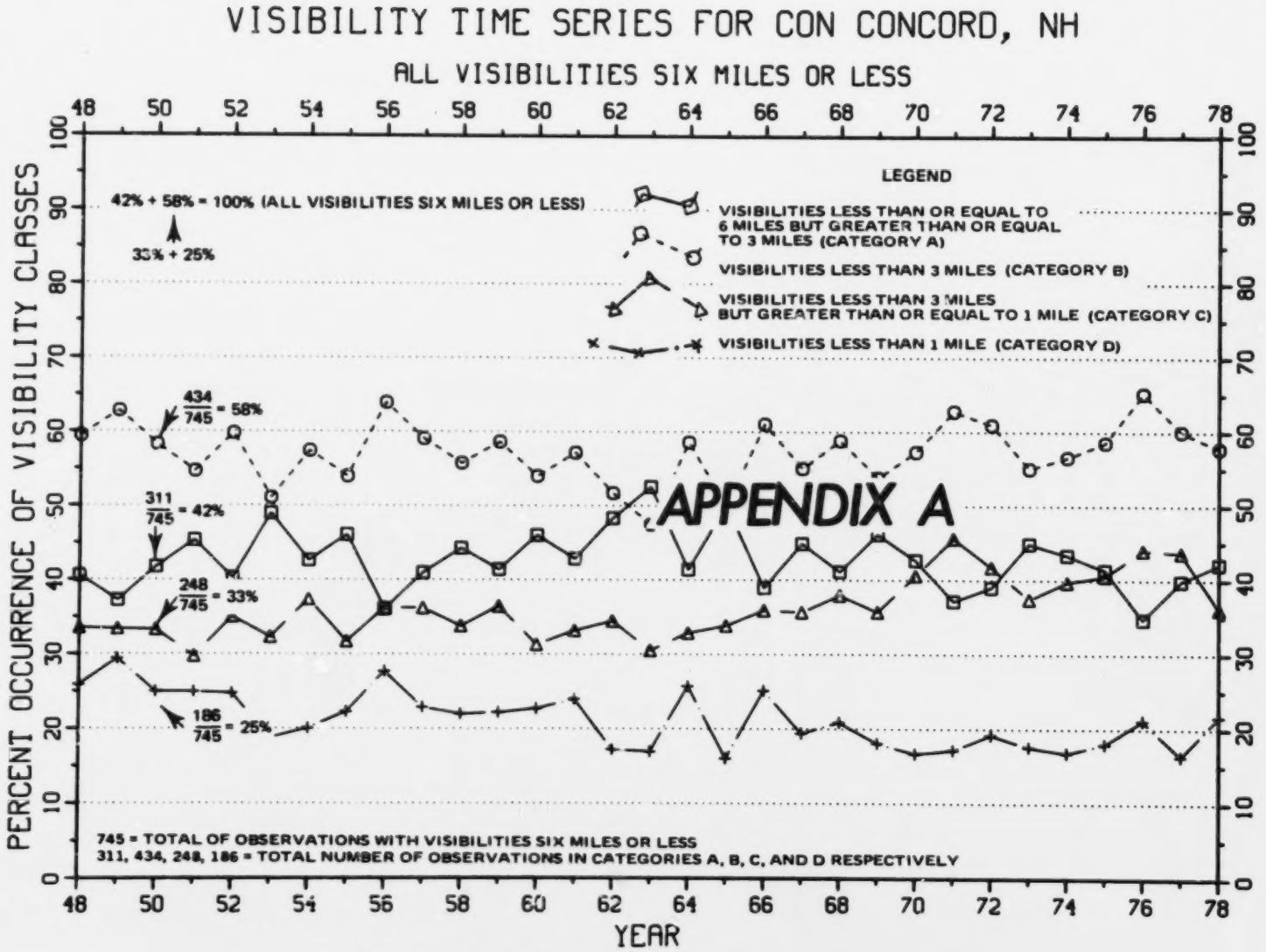
VISIBILITY TIME SERIES FOR CON CONCORD, NH
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
LEGEND
VISIBILITIES LESS THAN OR EQUAL TO 6 MILES BUT GREATER THAN OR EQUAL TO 3 MILES (CATEGORY A)
VISIBILITIES LESS THAN 3 MILES (CATEGORY B)
VISIBILITIES LESS THAN 3 MILES BUT GREATER THAN OR EQUAL TO 1 MILE (CATEGORY C)
VISIBILITIES LESS THAN 1 MILE (CATEGORY D)
42% + 58% = 100% (ALL VISIBILITIES SIX MILES OR LESS)
33% + 25%
434/745 = 58%
311/745 = 42%
248/745 = 33%
186/745 = 25%
APPENDIX A
745 = TOTAL OF OBSERVATIONS WITH VISIBILITIES SIX MILES OR LESS
311, 434, 248, 186 = TOTAL NUMBER OF OBSERVATIONS IN CATEGORIES A, B, C, AND D RESPECTIVELY

FIGURE 2. Sample time series for Appendix A, categories A - D

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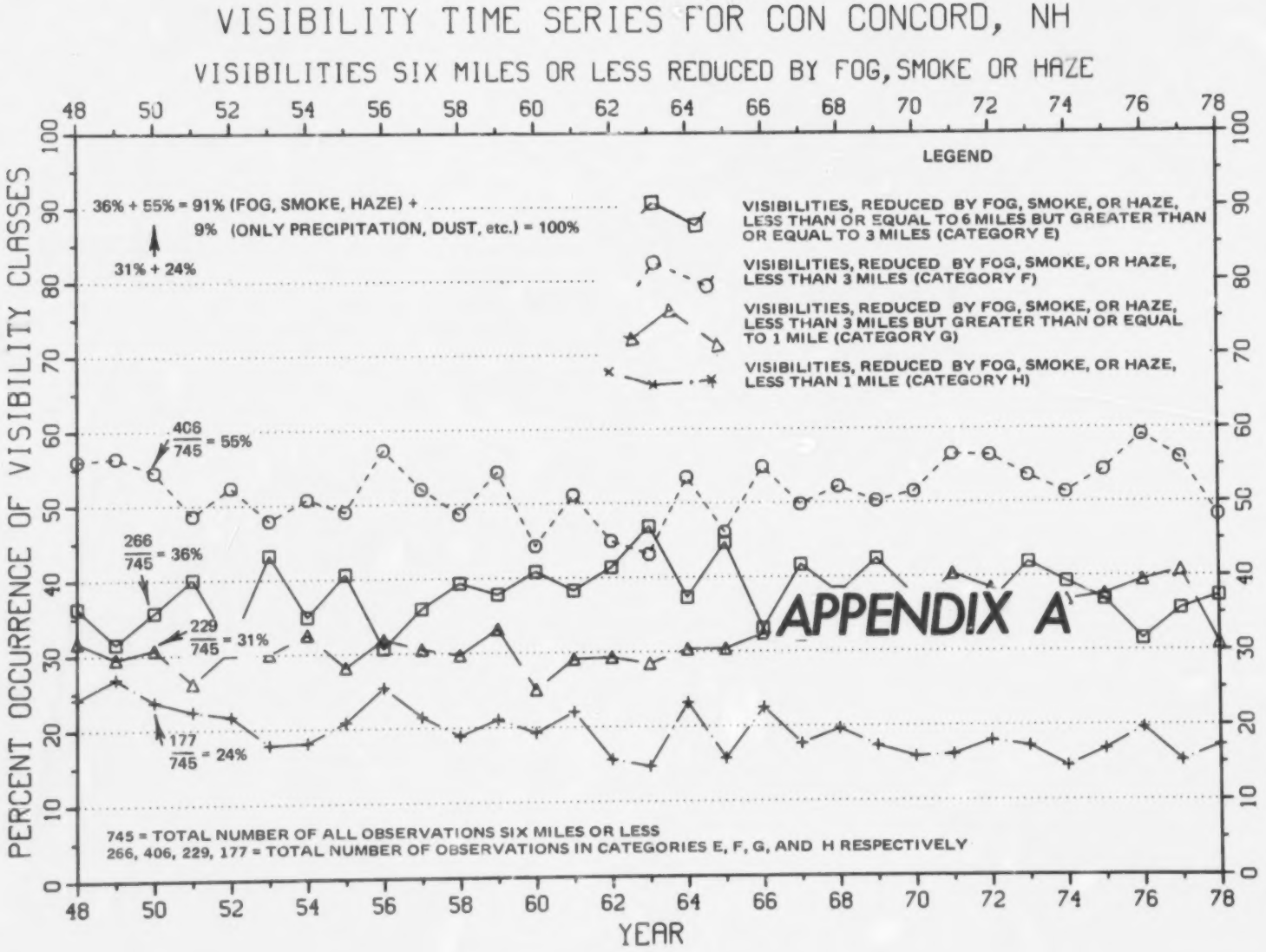
VISIBILITY TIME SERIES FOR CON CONCORD, NH
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
LEGEND
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN OR EQUAL TO 6 MILES BUT GREATER THAN OR EQUAL TO 3 MILES (CATEGORY E)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 3 MILES (CATEGORY F)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 3 MILES BUT GREATER THAN OR EQUAL TO 1 MILE (CATEGORY G)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 1 MILE (CATEGORY H)
36% + 55% = 91% (FOG, SMOKE, HAZE) +
9% (ONLY PRECIPITATION, DUST, etc.) = 100%
31% + 24%
406/745 = 55%
266/745 = 36%
229/745 = 31%
177/745 = 24%
745 = TOTAL NUMBER OF ALL OBSERVATIONS SIX MILES OR LESS
266, 406, 229, 177 = TOTAL NUMBER OF OBSERVATIONS IN CATEGORIES E, F, G, AND H RESPECTIVELY
APPENDIX A

FIGURE 3. Sample time series for Appendix A, categories E - H

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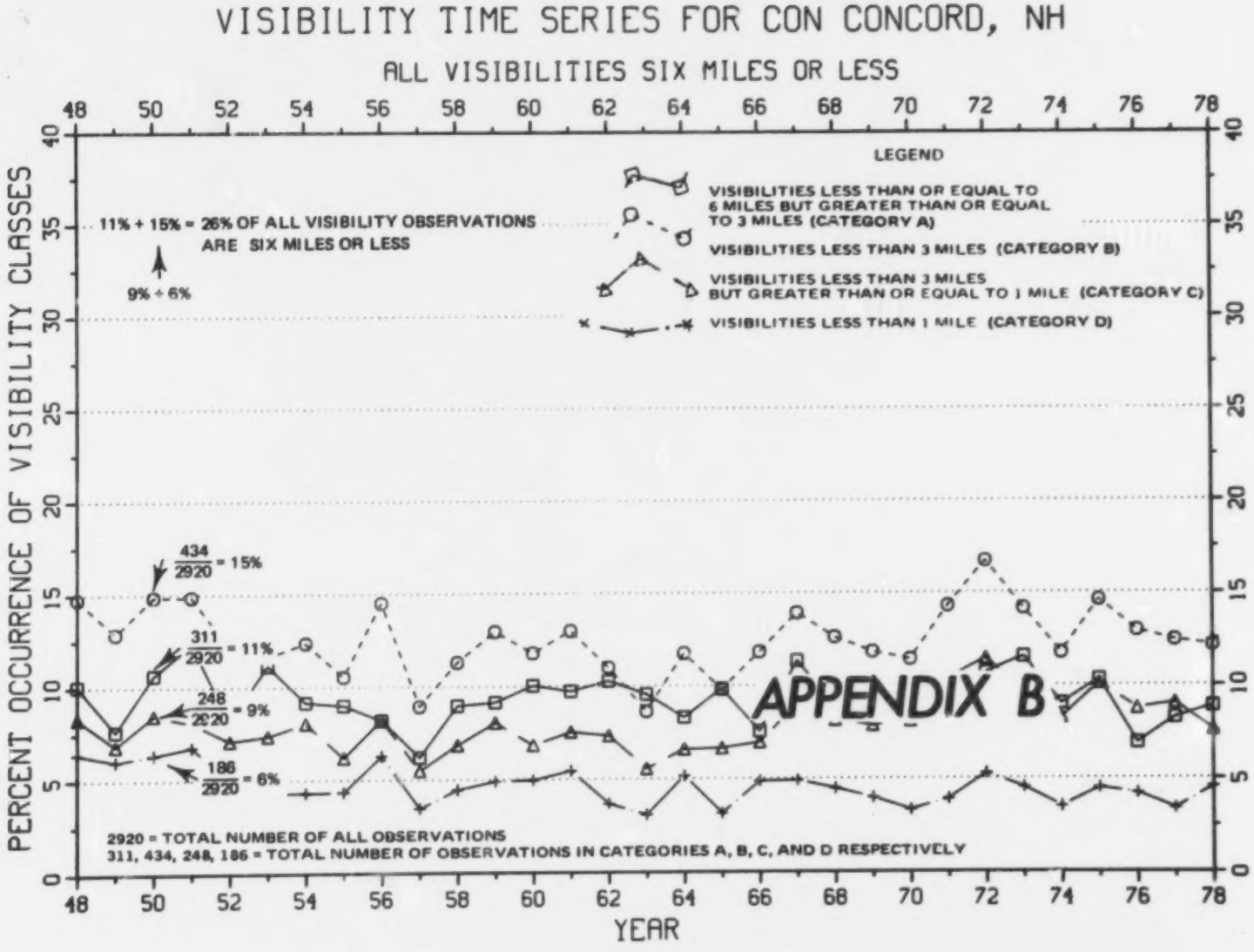
VISIBILITY TIME SERIES FOR CON CONCORD, NH
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
LEGEND
VISIBILITIES LESS THAN OR EQUAL TO 6 MILES BUT GREATER THAN OR EQUAL TO 3 MILES (CATEGORY A)
VISIBILITIES LESS THAN 3 MILES (CATEGORY B)
VISIBILITIES LESS THAN 3 MILES BUT GREATER THAN OR EQUAL TO 1 MILE (CATEGORY C)
VISIBILITIES LESS THAN 1 MILE (CATEGORY D)
11% + 15% = 26% OF ALL VISIBILITY OBSERVATIONS ARE SIX MILES OR LESS
9% ÷ 6%
434/2920 = 15%
311/2920 = 11%
248/2920 = 9%
186/2920 = 6%
2920 = TOTAL NUMBER OF ALL OBSERVATIONS
311, 434, 248, 186 = TOTAL NUMBER OF OBSERVATIONS IN CATEGORIES A, B, C, AND D RESPECTIVELY
APPENDIX B

FIGURE 4. Sample time series for Appendix B, categories A - D

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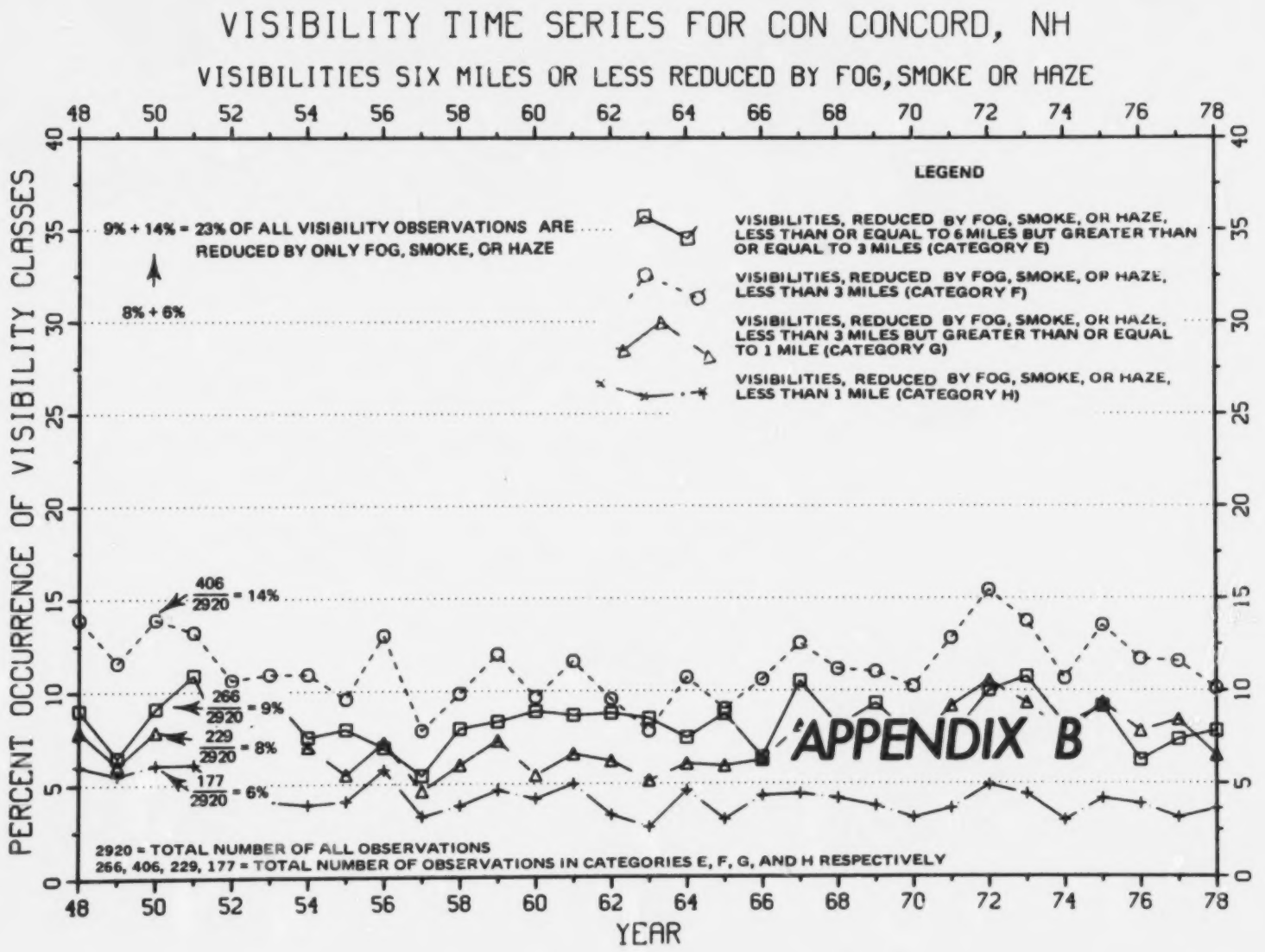
VISIBILITY TIME SERIES FOR CON CONCORD, NH
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
LEGEND
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN OR EQUAL TO 6 MILES BUT GREATER THAN OR EQUAL TO 3 MILES (CATEGORY E)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 3 MILES (CATEGORY F)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 3 MILES BUT GREATER THAN OR EQUAL TO 1 MILE (CATEGORY G)
VISIBILITIES, REDUCED BY FOG, SMOKE, OR HAZE, LESS THAN 1 MILE (CATEGORY H)
9% + 14% = 23% OF ALL VISIBILITY OBSERVATIONS ARE REDUCED BY ONLY FOG, SMOKE, OR HAZE
8% + 6%
406/2920 = 14%
266/2920 = 9%
229/2920 = 8%
177/2920 = 6%
2920 = TOTAL NUMBER OF ALL OBSERVATIONS
266, 406, 229, 177 = TOTAL NUMBER OF OBSERVATIONS IN CATEGORIES E, F, G, AND H RESPECTIVELY
APPENDIX B

FIGURE 5. Sample time series for Appendix B, categories E - H

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changes in visibility. First, a natural variation in the climate may have occurred whereby the physical relationships controlling the atmosphere changed. Second, man's activities may have affected visibilities through increased industrialization, compliance with the Clean Air Act or changes in energy usage. Third, shifts in the time series could be caused by changing weather observing practices such as movement of visibility markers, increased emphasis in observing selected phenomena or new operational criteria at airports. Trends in the time series probably reflect all three of these reasons, but this study does not attempt to isolate specific causes for any shift in visibilities.

The visibility time series in Appendices A and B have been summarized on a regional basis and are presented in the following section. Appendices A and B follow this summarization and are given in aphabetical order by state within each region (see Station List).

REGIONAL SUMMARIES

ANE New England

On an annual basis, visibility less than 7 miles occurred about 15 to 25 percent of the time in this region. These were some of the highest percentages (poorest visibilities) for the entire country. Overall, the time series in Appendix B showed little change. After 1972, however, Hartford and Boston both showed a five to 10 percent reduction in the number of visibility occurrences between 3 and 6 miles.

Redistributions among individual visibility categories are shown in Appendix A for Boston, Concord and Burlington (almost no change was observed at Harford). When a restriction was observed, Boston experienced a 20 percent variability in the time visibilities were between 3 and 6 miles. A corresponding variability occurred in the less than 3-mile category. Concord indicated a significant redistribution between the less than 1-mile category and the less than 3- but greater than or equal to 1-mile category. Some change in the type of weather phenomena reducing visibility occurred at Burlington before 1960 since the graphical difference between the two time series occurring in Appendix A was not constant.

AEA Eastern

The occurrence of visibility less than 7 miles decreased by almost 20 percent at Newark between 1948 and 1978. This was the largest improvement of all stations studied. Buffalo, Albany, and Norfolk also followed this trend with a five to 10 percent decrease in the occurrence of visibilities between 3 and 6 miles. But, at these stations there was also an increase in the less than 3-mile category until 1970. After 1970, occcurrences of visibilities less than 3 miles started to decrease at Albany and Norfolk but continued to increase slightly at Buffalo. Washington DC showed a constant decrease of about five percent in the less than 3-mile category while Roanoke had a small increase in the occurrence of visibilities between 3 and 6 miles after 1968. Overall, visibilities less than 7 miles occurred annually from 20 to 40 percent of the time at most of the stations in this region.

Analysis of Appendix A indicated a redistribution from the 3- to 6-mile category to the less than 3-mile category at Albany, Buffalo, and Norfolk following trends similar to Appendix B. The opposite type shift was observed at Washington DC and Roanoke. The distribution among visibility categories at Newark remained fairly stable.

ASO Southern

A significant increase in the percentage of time observed visibilities were less than 7 miles has occurred throughout the region. A five to eight percent increase is noted after the early 1960's at Mobile and West Palm Beach and after the middle to late 1950's at Atlanta, Charleston, and Knoxville. The major deterioration in visibility occurred at Atlanta and Charleston. In the 1970's, the percentage of time that visibilities were below 7 miles was fairly constant, but high at Mobile, West Palm Beach, and Atlanta. Visibility improved at Charleston and Knoxville, but still remained worse than during the early years. The trends are similar when considering all reduced visibilities or those reduced by fog, smoke or haze.

The trends have been influenced mainly by the increase in the number of observations in the 3- to 6-mile category (as shown by the graphs in Appendix A). At all stations, except Knoxville, the percentage of time that visibilities have been in this category

has steadily increased. At Knoxville, however, the opposite is apparent; the number of occurrences of visibilities less than 3 miles has increased.

AGL Great Lakes

One of the greatest improvements of all stations studied in overall visibility occurred at Chicago between 1948 and 1978. Chicago saw the occurrence of visibility between 3 and 6 miles decrease about 15 percent with the largest decrease occurring after 1969. Akron also followed this trend with a five percent decrease in the 3- to 6-mile category. There was, however, a small increase at Akron when visibilities were less than 3 miles. At Cincinnati visibilities less than 7 miles were observed about eight percent more often in 1962 than in the early 1950's. The number of occurrences stayed fairly constant for the remainder of the 1960's before finally decreasing by about five percent in the 1970's. International Falls, Minneapolis-St Paul, and Sault Ste Marie all exhibited little change.

Chicago and Akron both showed a small redistribution among the visibility categories as indicated in Appendix A. There was a five to 10 percent shift to the less than 3-mile category from the 3- to 6-mile category at these two stations. The type of weather phenomena reducing visibility changed at International Falls in the years before 1960.

ACE Central

A very large deterioration in visibility less than 7 miles has occurred at St. Louis. After 1964, the occurrence of visibilities between 3 and 6 miles increased at an annual rate of almost one percent for a total deterioration of 13 percent through 1978. Visibilities less than 3 miles have also worsened, but only by four percent over the same period. On an annual basis, overall visibilities less than 7 miles were reported 18 percent of the time in the middle 1960's but jumped to almost 35 percent by 1978. Grand Island also showed a deterioration, but only by about four percent between 1955 and 1978.

The distribution among individual categories at St. Louis, as shown in Appendix A, reflects changes but not as drastic as the overall visibility. When a restriction was reported, a nine percent shift to the 3- to 6-mile category was observed after 1972 with a

corresponding decrease in the less than 3-mile category. Grand Island did experience some type of change in weather phenomena reducing visibility before 1957.

ASW Southwest

The occurrence of visibilities between 3 and 6 miles increased by over 20 percent since 1954 at Little Rock, but the occurrences in the less than 3-mile category remained constant. Overall visibility less than 7 miles occurred annually at close to 10 percent of the time in the mid-1950's, but jumped to near 30 percent by the late 1970's. Visibilities deteriorated slightly at most other stations in this region, but Albuquerque showed little change.

Appendix A indicated a change in the type of weather phenomena reducing visibility at all six stations in this region before the middle 1960's. The graphical difference between the two time series becomes constant at these six stations from the late 1960's into the 1970's. Little redistribution among the visibility classes was observed in this later time period.

Except for Little Rock, visibilities occurred annually less than 10 percent of the time. But, at Albuquerque this percentage dropped to around two. These low observation counts caused the time series in Appendix A to vary wildly and must be viewed with caution. When analyzing Albuquerque, one also must remember these time series only show visibilities less than 7 miles. Visibility might have deteriorated drastically from observing 40 miles in 1948 to just 10 miles in 1978, but this would not be reflected in the time series of this study.

ARM Rocky Mountain

There was very little overall visibility change in this region. Visibilities less than 7 miles were observed less than 15 percent of the time for a given year and showed little variation at most of the stations. There were two minor exceptions, however. Missoula showed a deterioration in visibility of about five percent in all categories between 1957 and 1968, but then improved five percent and stabilized in the 1970's. Bismarck indicated a three percent increase in the time observed visibilities were between 3 and 6 miles from the mid-60's onward.

For many stations in this region, the graphical difference between the two time series in Appendix A indicated some change in the type of weather phenomena reducing visibility. The graphical difference between the two time series was not constant in the 1970's at Denver, while Bismarck showed differences before 1960. Billings and Missoula indicated a change in the graphical difference at both stations in the 1970's and also before 1960. Cedar City and Salt Lake City showed very erratic changes.

ANW Northwest

Some of the smallest changes in overall visibility occurred in this region. The largest changes were at Salem and Seattle-Tacoma, where a three percent improvement occurred after 1962. Overall, the percentage of time visibility was less than 7 miles ranged from 25 percent near the Pacific Coast to about 10 percent in the mountains.

There have been changes in the distribution among individual categories as shown in Appendix A. When an obstruction was reported, Salem experienced a 10 percent increase in time visibilities were between 3 and 6 miles with a corresponding decrease in the less than 3-mile category. Seattle-Tacoma indicated a similar increase in the 3- to 6-mile category but little change when visibilities were less than 3 miles. Spokane has shown the opposite trend to that at Salem. Very erratic changes have occurred at Boise and probably reflect low observation counts when visibilities were less than 7 miles.

AWE West

The occurrence of visibility less than 7 miles decreased by around 18 percent at Los Angeles since 1948. The major change occurred in the less than 3-mile category. An improvement of only five percent was observed when visibilities were between 3 and 6 miles after 1970. San Francisco also showed some improvement after 1960, but only about five percent. Little change was observed at the other five stations in this region. Phoenix, Yuma, Daggett, and Lovelock showed the best visibility in the entire country in the zero- to 6-mile range. However, significant changes might have occurred when visibilities were greater than 6 miles. This condition is not reflected in these time series.

Very few observations in the zero- to 6-mile range produced drastic changes in Appendix A. This is because annual percentages are based only on visibilities less than 7 miles and not on all visibilities as in Appendix B. The time series in Appendix A for Phoenix, Yuma, Daggett, and Lovelock must, therefore, be viewed with caution since less than three percent of all annual visibilities are between zero and 6 miles. The three remaining stations in this region did have a significant number of visibilities less than 7 miles. Of these three, Sacramento and San Francisco showed little redistribution among categories. But, when an obstruction was reported at Los Angeles, there was a 20 percent increase in the time visibilities were between 3 and 6 miles with a corresponding decrease in the less than 3-mile category.

AAL Alaska and APC Pacific

The least amount of change in overall visibility occurred in these regions. Juneau and McGrath did show a minor three percent deterioration in visibility between 1960 and 1964, but then improved three percent after 1965. Hilo exhibited the least amount of variations of all stations studied. Fog, smoke or haze is almost never a reported obstruction at this station.

There was some redistribution among individual categories at Hilo, however. From 1964 to 1978, 10 percent more visibilities had shifted into the less than 3-mile category when an obstruction was reported. A corresponding decrease of 10 percent had occurred when visibilities were between 3 and 6 miles. A change in the type of weather phenomena reducing visibility had occurred at Juneau. This is most noticeable by comparing categories A and E of Appendix A between the years 1948 and 1958.

KEY STATION LIST

REGION ST CITY	APPENDIX A AND B GRAPH 1	 GRAPH 2	 GRAPH 1	 GRAPH 2
ANE NEW ENGLAND				
CT, Hartford	A-2	A-3	B-2	B-3
MA, Boston	A-4	A-5	B-4	B-5
NH, Concord	A-6	A-7	B-6	B-7
VT, Burlington	A-8	A-9	B-8	B-9
AEA EASTERN				
DC, Washington	A-10	A-11	B-10	B-11
NJ, Newark	A-12	A-13	B-12	B-13
Ny, Albany	A-14	A-15	B-14	B-15
Ny, Buffalo	A-16	A-17	B-16	B-17
VA, Norfolk	A-18	A-19	B-18	B-19
VA, Roanoke	A-20	A-21	B-20	B-21
ASO SOUTHERN				
AL, Mobile	A-22	A-23	B-22	B-23
FL, West Palm Beach	A-24	A-25	B-24	B-25
GA, Atlanta	A-26	A-27	B-26	B-27
SC, Charleston	A-28	A-29	B-28	B-29
TN, Knoxville	A-30	A-31	B-30	B-31
AGL GREAT LAKES				
IL, Chicago	A-32	A-33	B-32	B-33
MI, Sault Ste Marie	A-34	A-35	B-34	B-35
MN, International Falls	A-36	A-37	B-36	B-37
MN, Minneapolis St Paul	A-38	A-39	B-38	B-39
OH, Akron	A-40	A-41	B-40	B-41
OH, Cincinnati	A-42	A-43	B-42	B-43
ACE CENTRAL				
MO, St Louis	A-44	A-45	B-44	B-45
NE, Grand Island	A-46	A-47	B-46	B-47

BEST DOCUMENT AVAILABLE

ASW SOUTHWEST				
AR, Little Rock	A-48	A-49	B-48	B-49
NM, Albuquerque	A-50	A-51	B-50	B-51
OK, Oklahoma City	A-52	A-53	B-52	B-53
TX, Austin	A-54	A-55	B-54	B-55
TX, Brownsville	A-56	A-57	B-56	B-57
TX, Lubbock	A-58	A-59	B-58	B-59
ARM ROCKy MOUNTAIN				
CO, Denver	A-60	A-61	B-60	B-61
MT, Billings	A-62	A-63	B-62	B-63
MT, Missoula	A-64	A-65	A-64	B-65
ND, Bismarck	A-66	A-67	B-66	B-67
UT, Cedar City	A-68	A-69	B-68	B-69
UT, Salt Lake City	A-70	A-71	B-70	B-71
ANW NORTHWEST				
ID, Boise	A-72	A-73	B-72	B-73
OR, Salem	A-74	A-75	B-74	B-75
WA, Seattle-Tacoma	A-76	A-77	B-76	B-77
WA, Spokane	A-78	A-79	B-78	B-79
AWE WESTERN				
AZ, Phoenix	A-80	A-81	B-80	B-81
AZ, yuma	A-82	A-83	B-82	B-83
CA, Daggett	A-84	A-85	B-84	B-85
CA, Los Angeles	A-86	A-87	B-86	B-87
CA, Sacramento	A-88	A-89	B-88	B-89
CA, San Francisco	A-90	A-91	B-90	B-91
NV, Lovelock	A-92	A-93	B-92	B-93
AAL ALASKA				
AK, Fairbanks	A-94	A-95	B-94	B-95
AK, Juneau	A-96	A-97	B-96	B-97
AK, King Salmon	A-98	A-99	B-98	B-99
AK, McGrath	A-100	A-101	B-100	B-101
APC PACIFIC				
HI, Hilo	A-102	A-103	B-102	B-103

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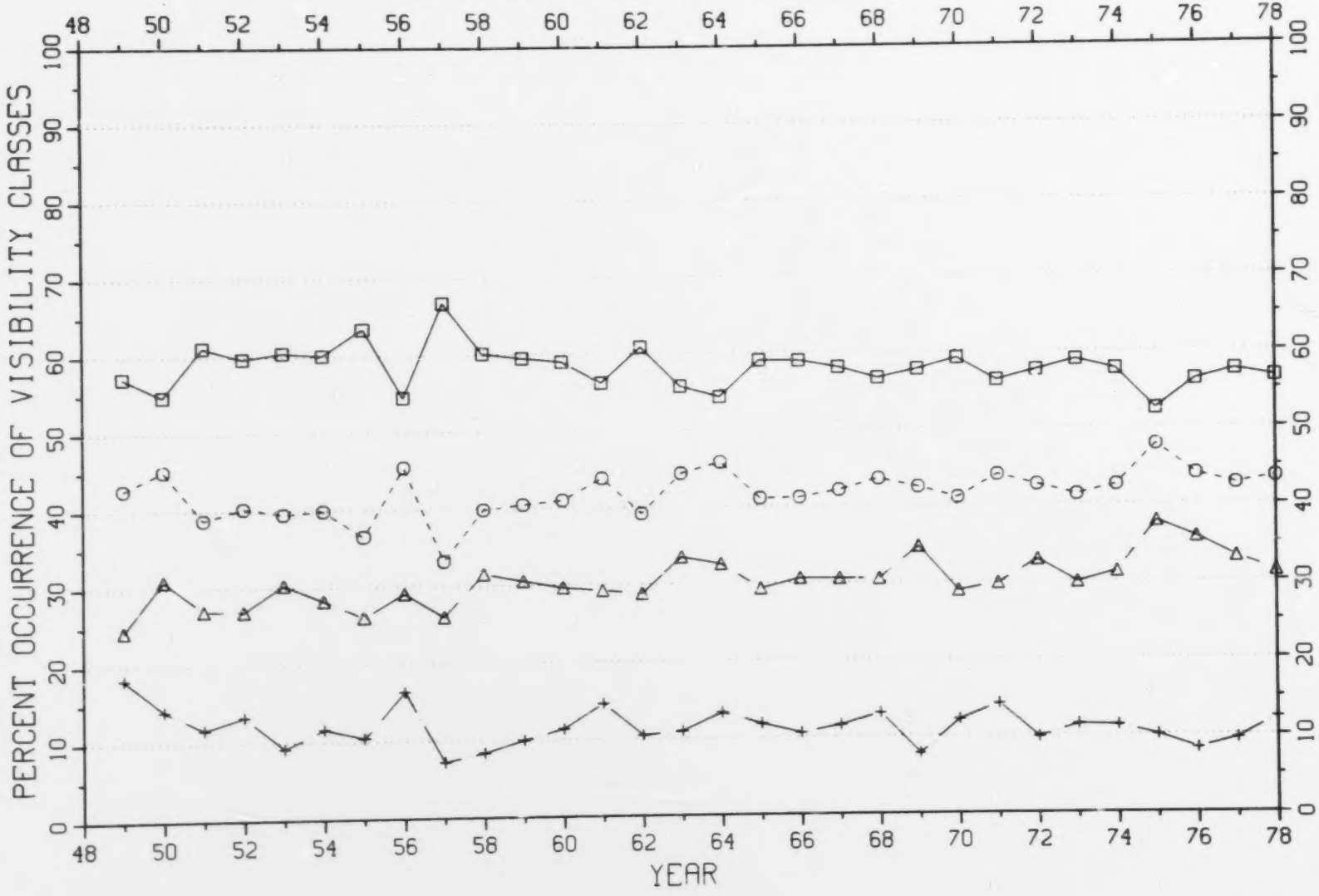
APPENDIX A



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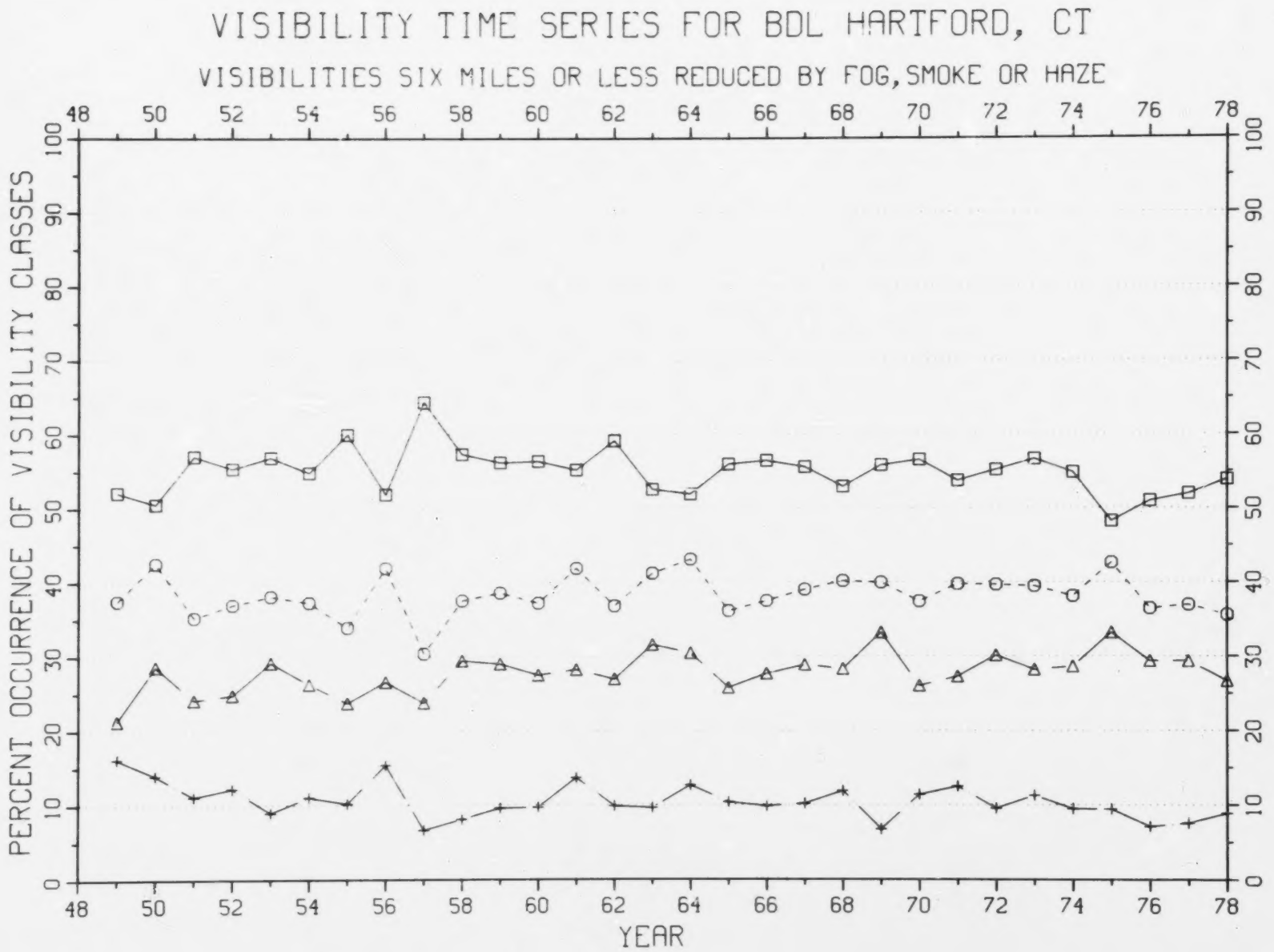

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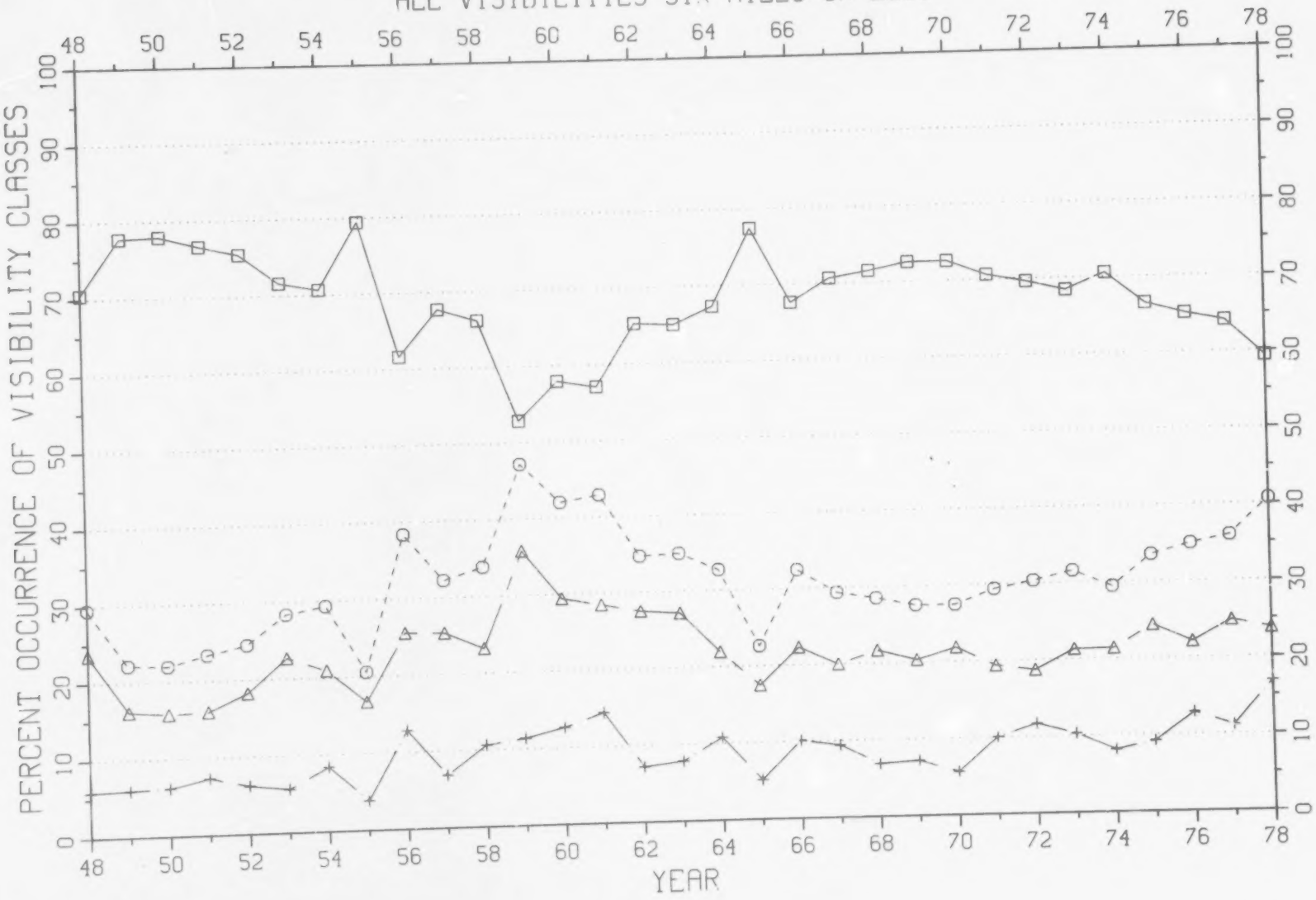
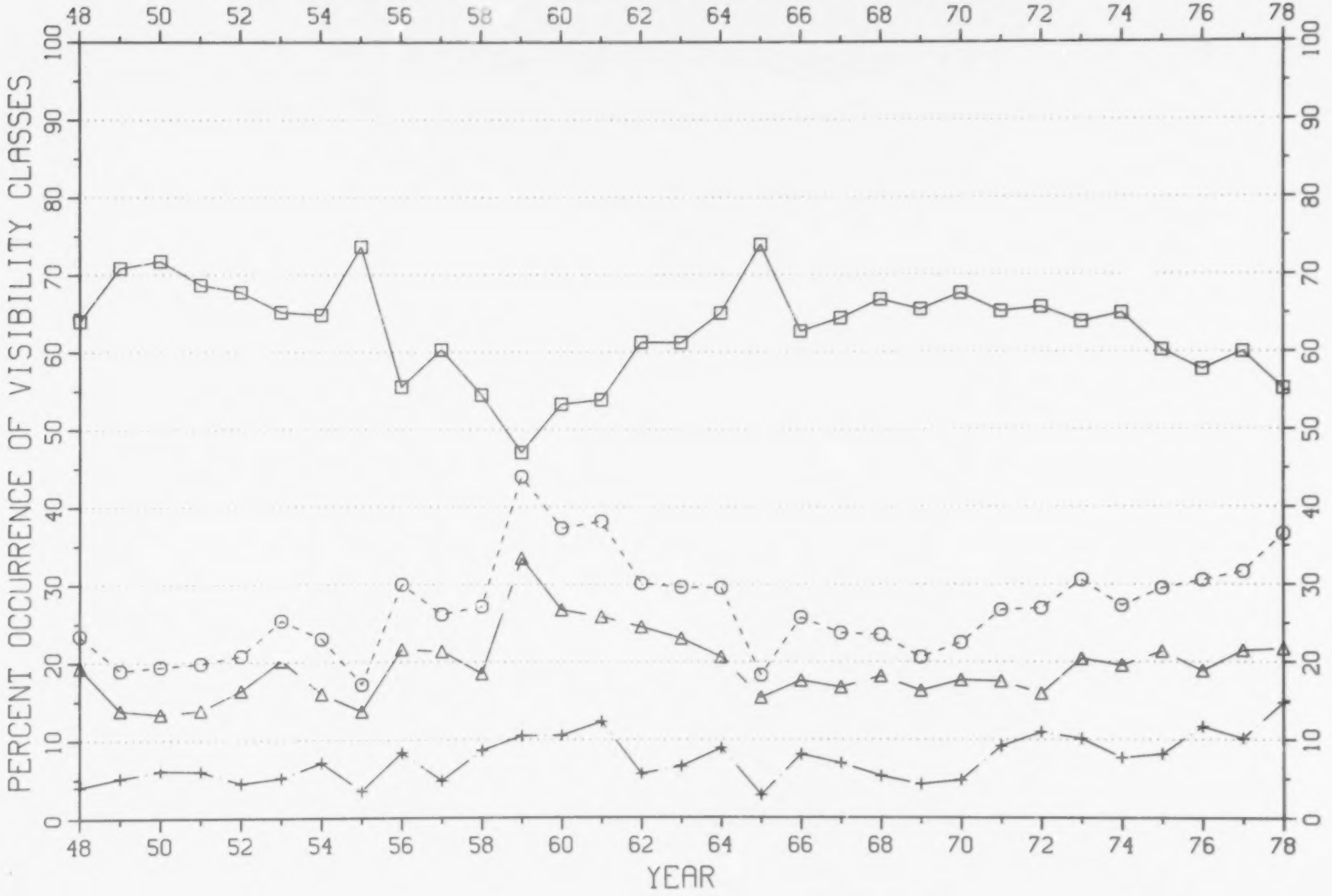

VISIBILITY TIME SERIES FOR BOS BOSTON, MA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR BOS BOSTON, MA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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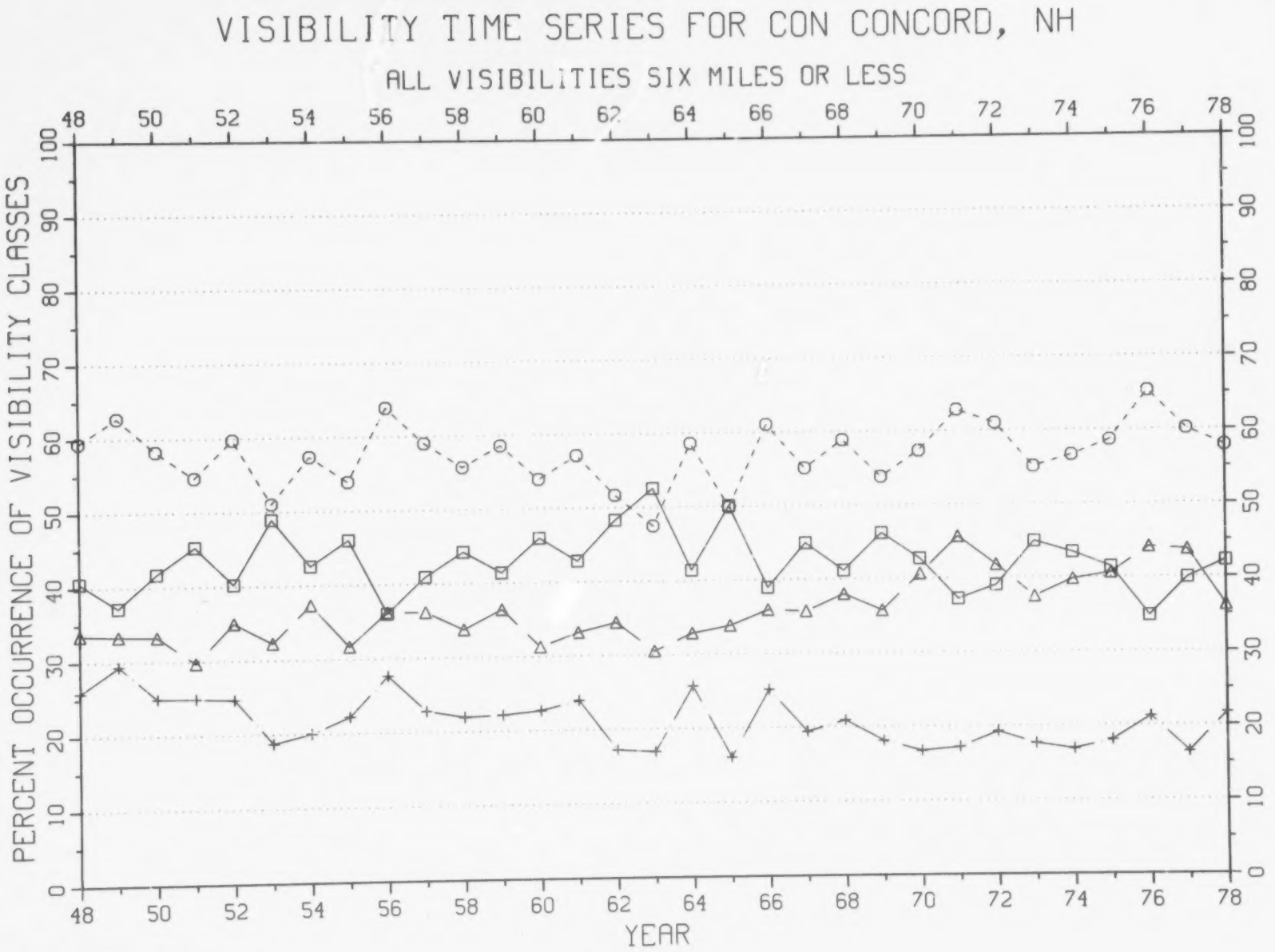

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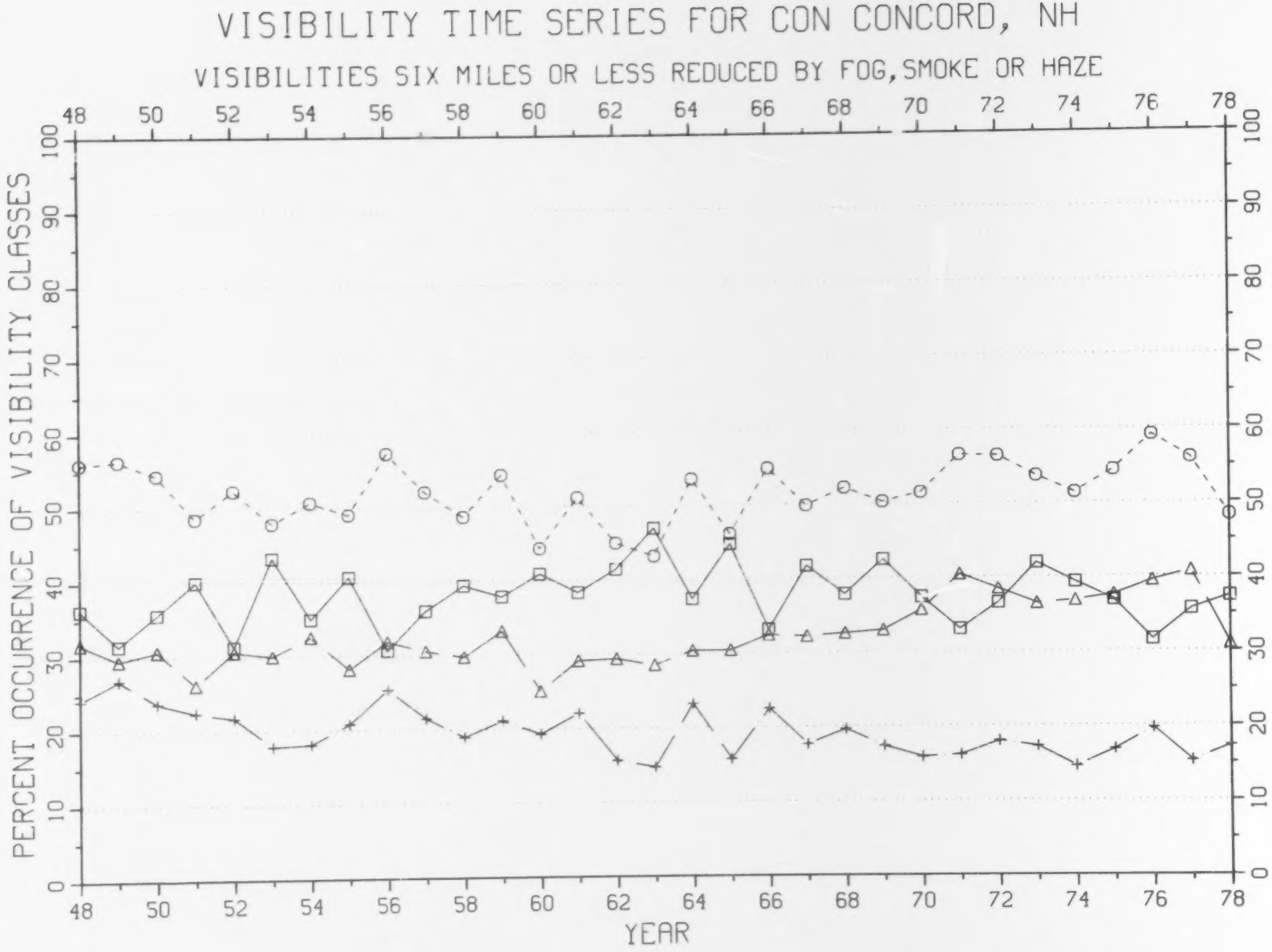
VISIBILITY TIME SERIES FOR CON CONCORD, NH
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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0 10 20 30 40 50 60 70 80 90 100

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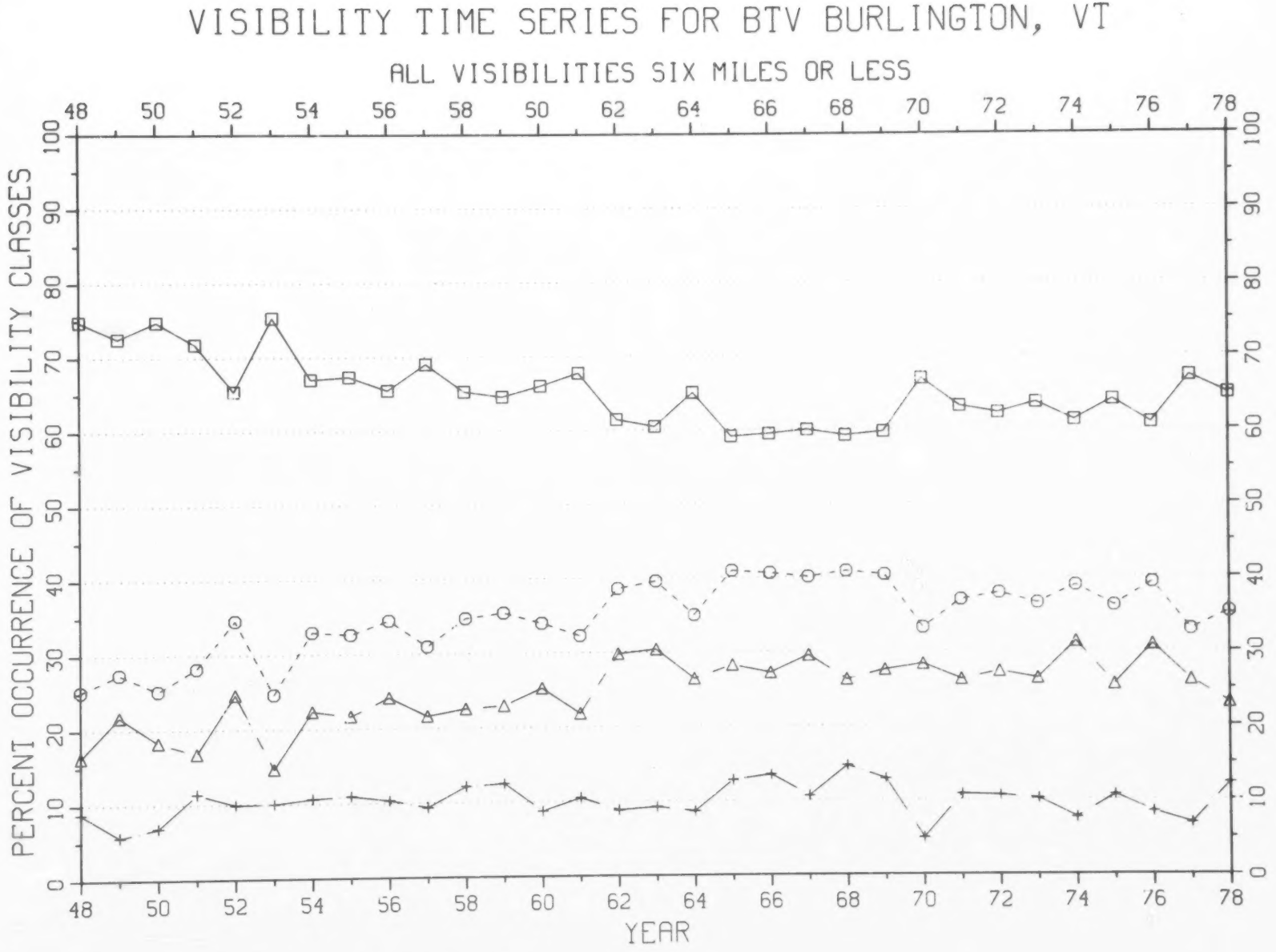
VISIBILITY TIME SERIES FOR BTV BURLINGTON, VT
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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0 10 20 30 40 50 60 70 80 90 100

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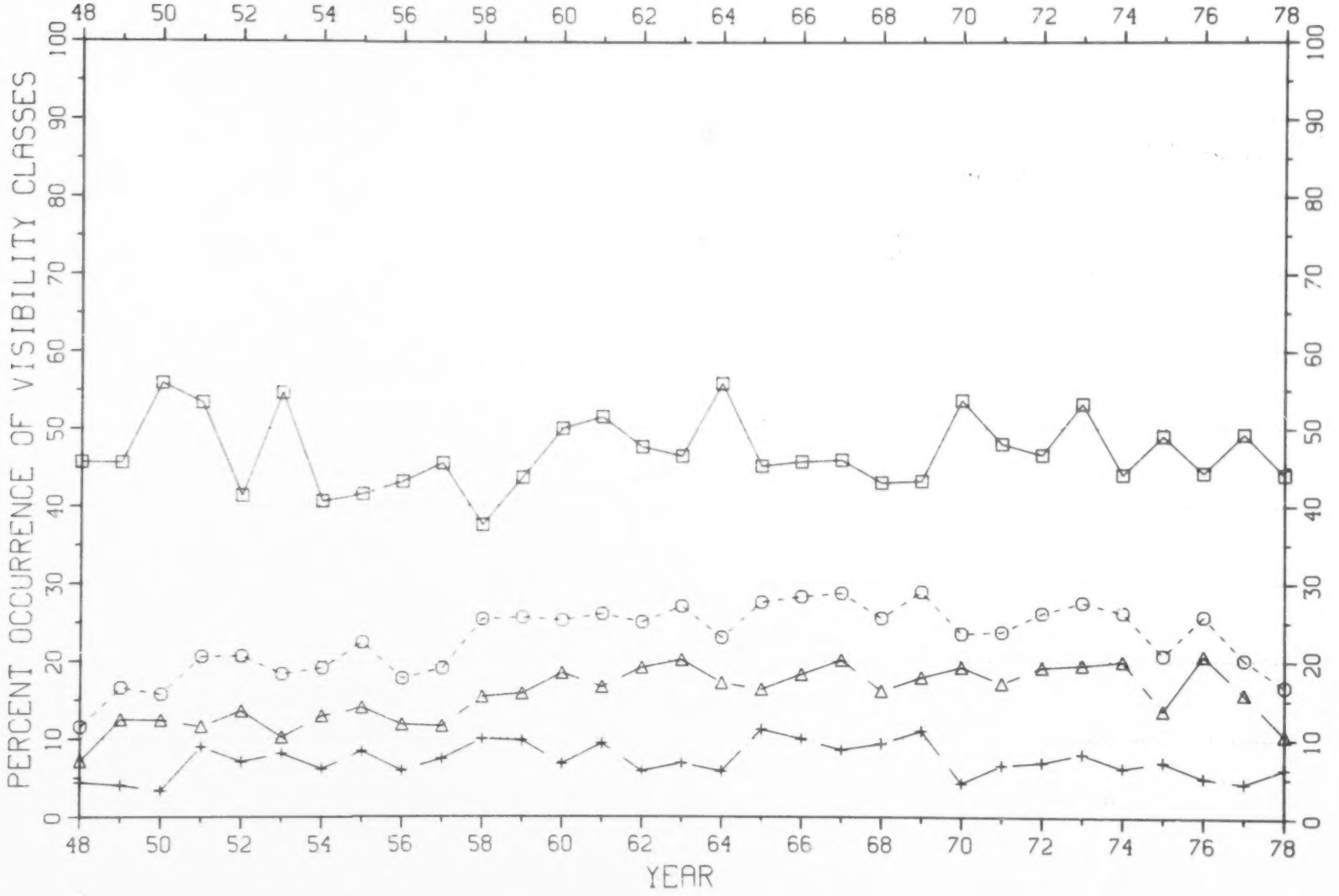
VISIBILITY TIME SERIES FOR BTV BURLINGTON, VT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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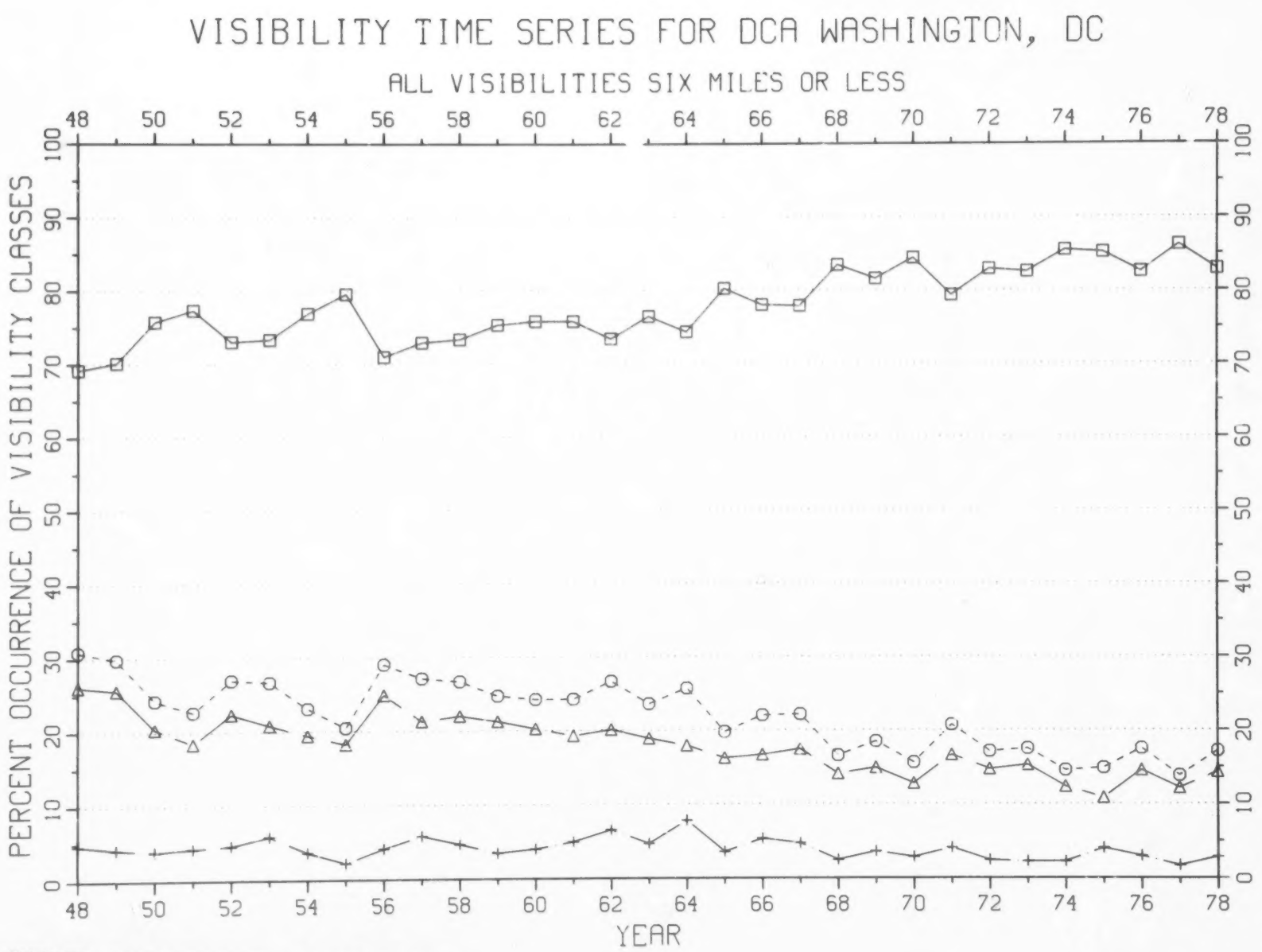
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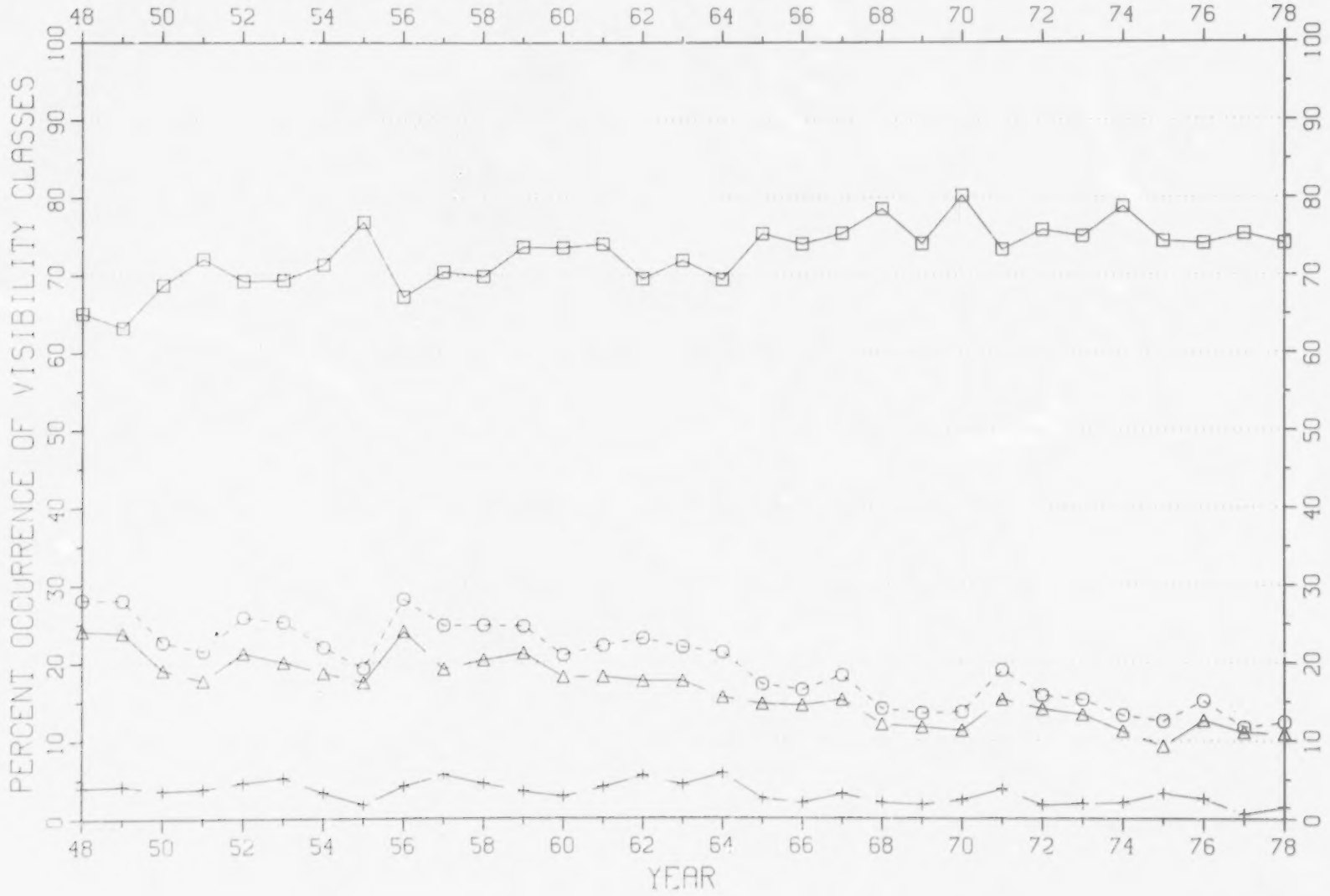
VISIBILITY TIME SERIES FOR DCA WASHINGTON, DC
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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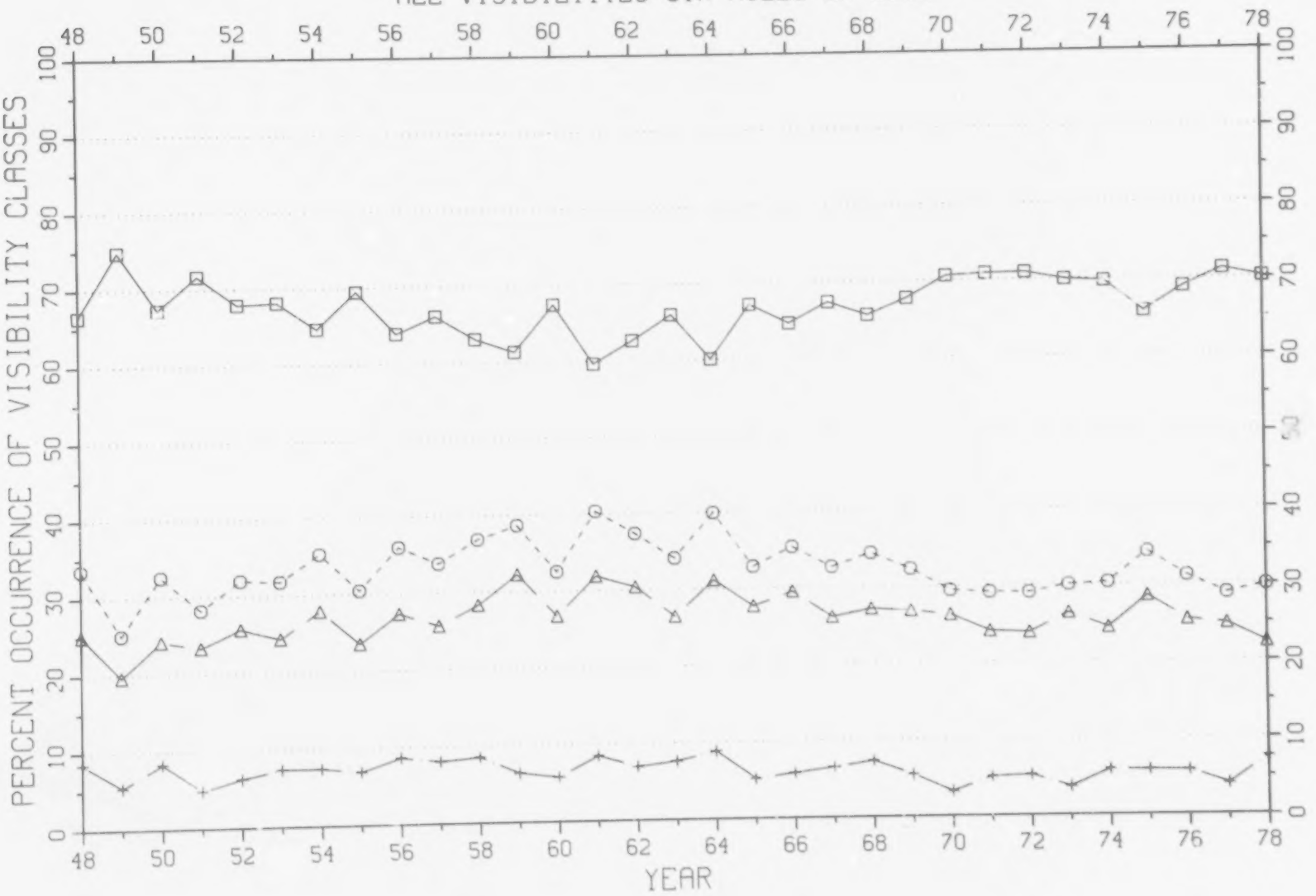

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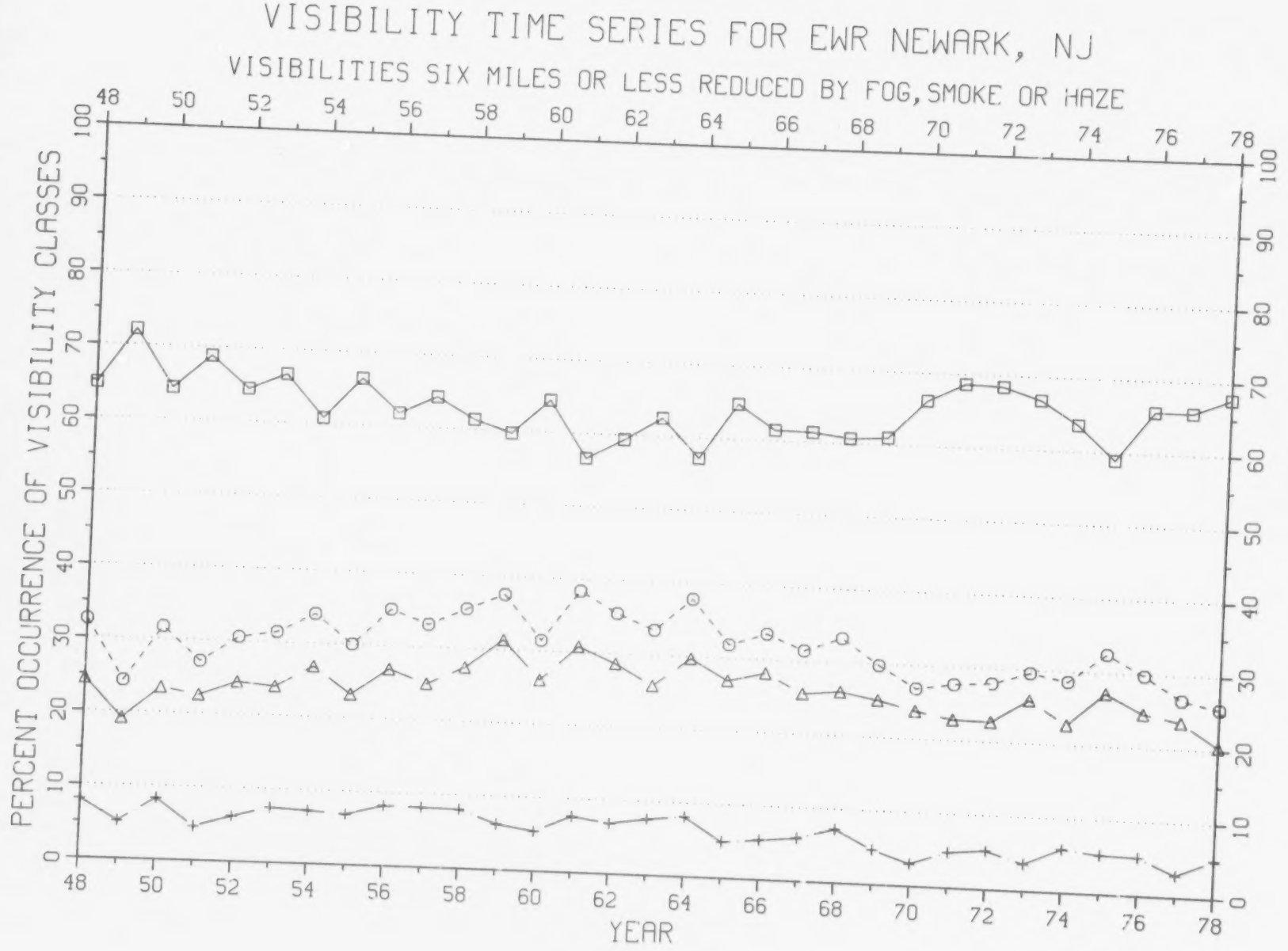

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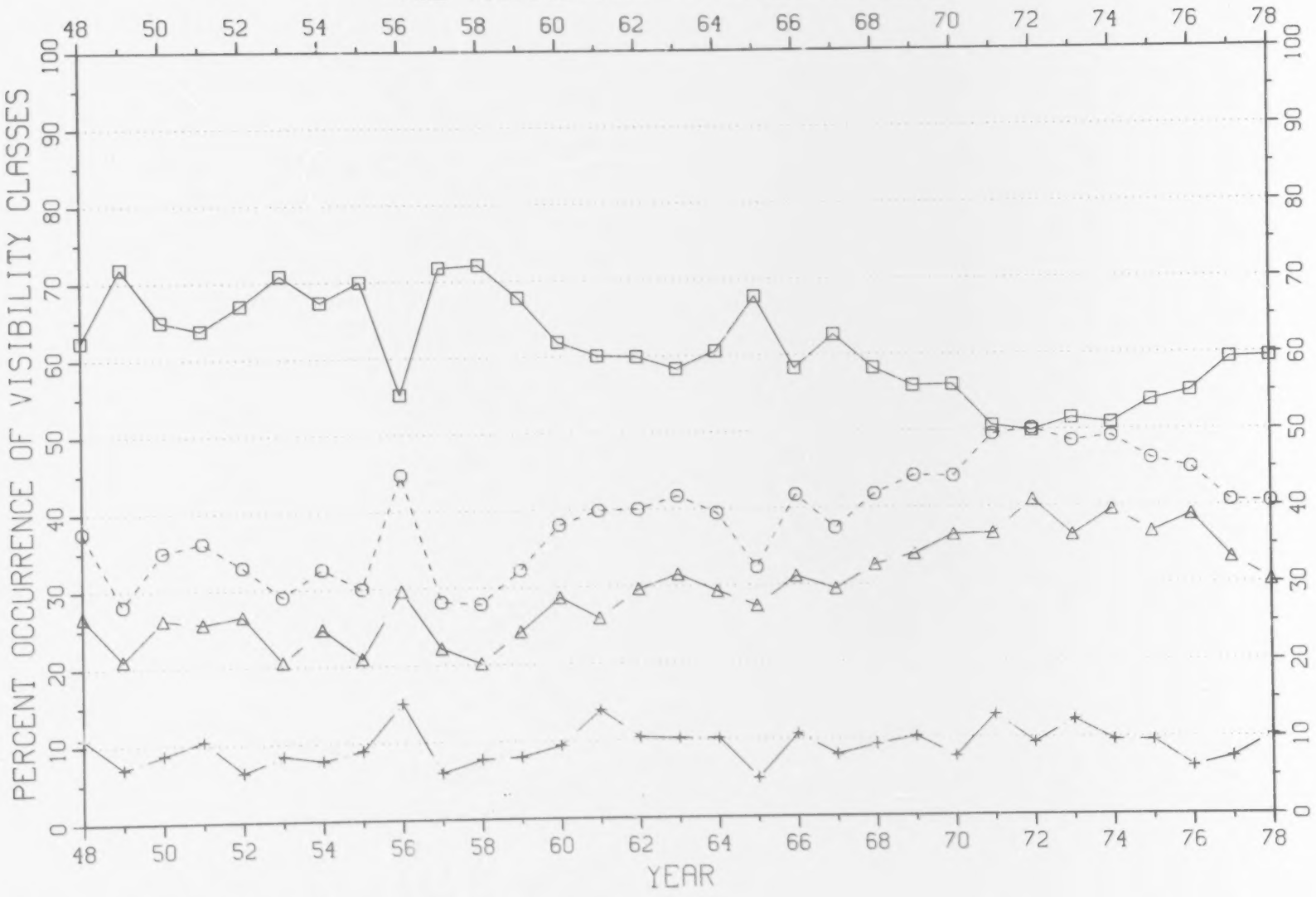

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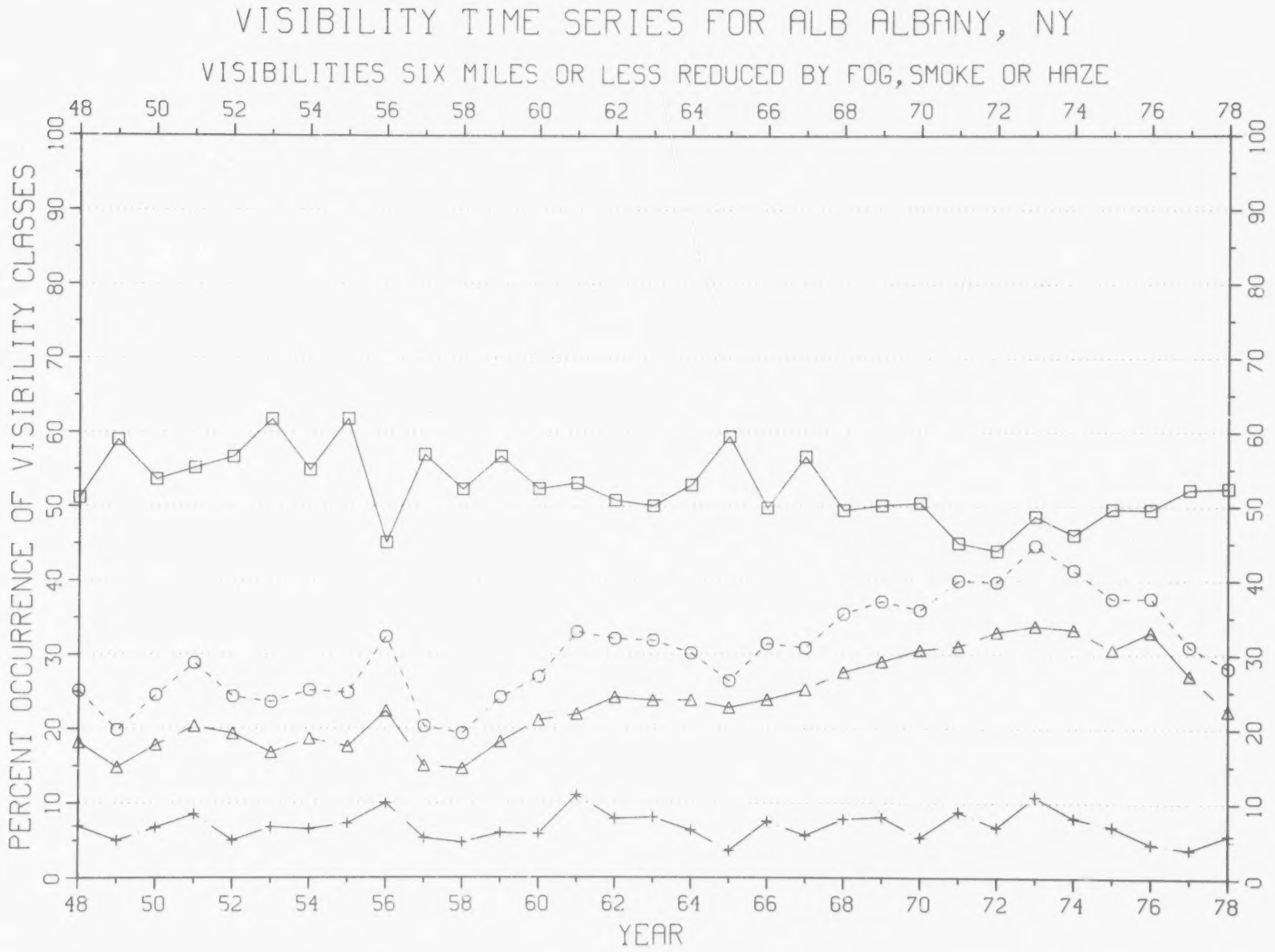
VISIBILITY TIME SERIES FOR ALB ALBANY, NY
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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0 10 20 30 40 50 60 70 80 90 100

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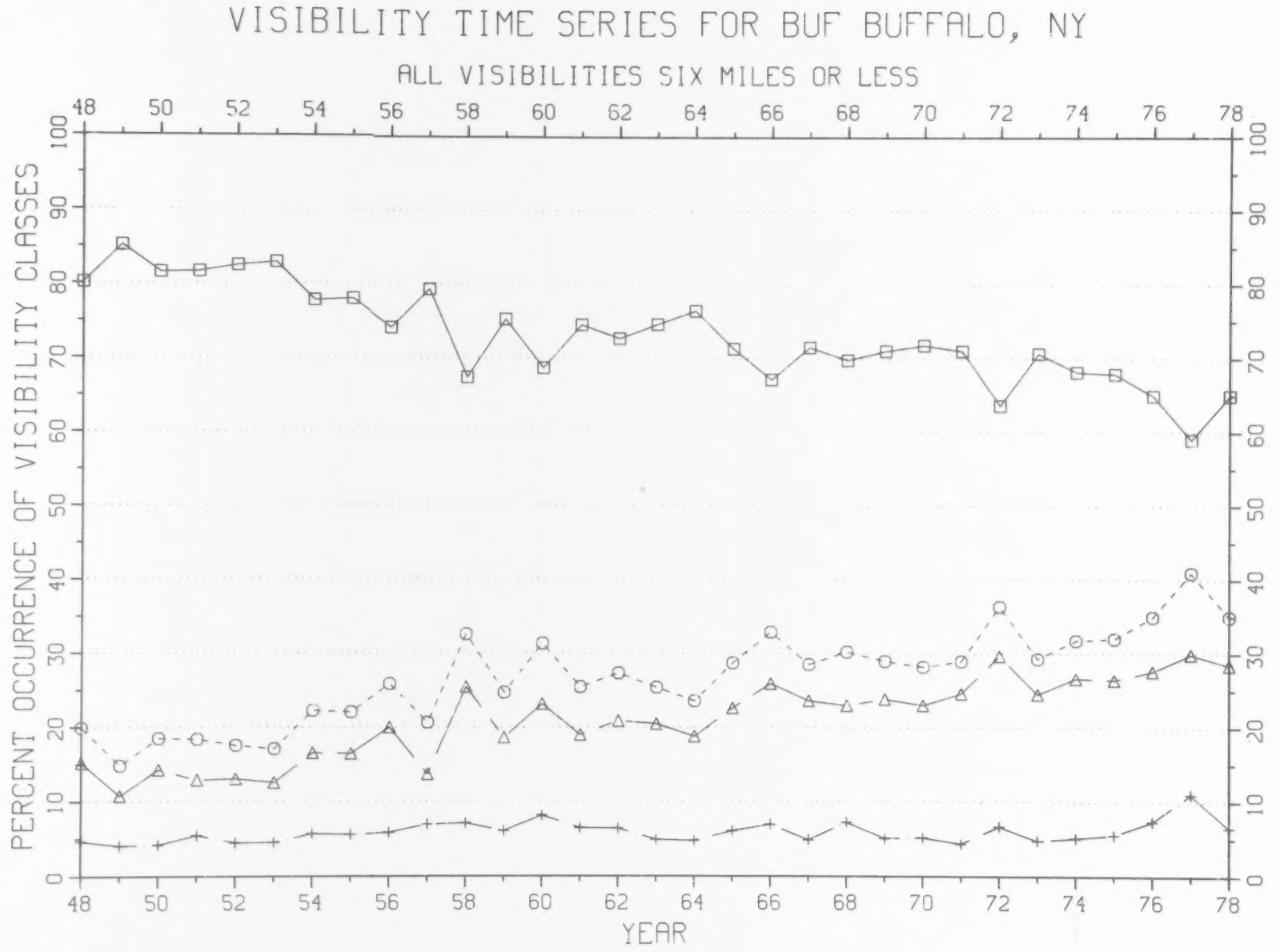

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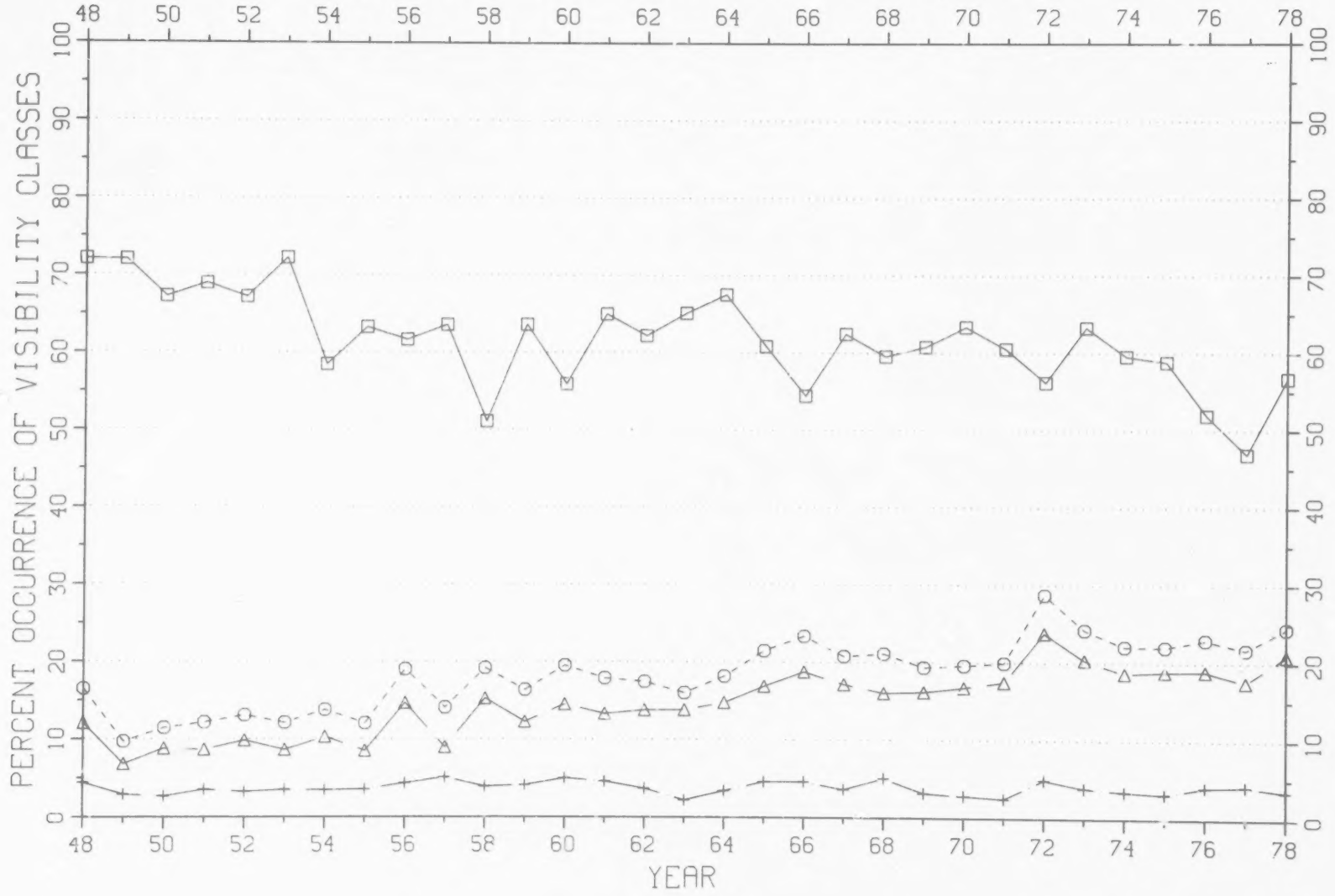
VISIBILITY TIME SERIES FOR BUF BUFFALO, NY

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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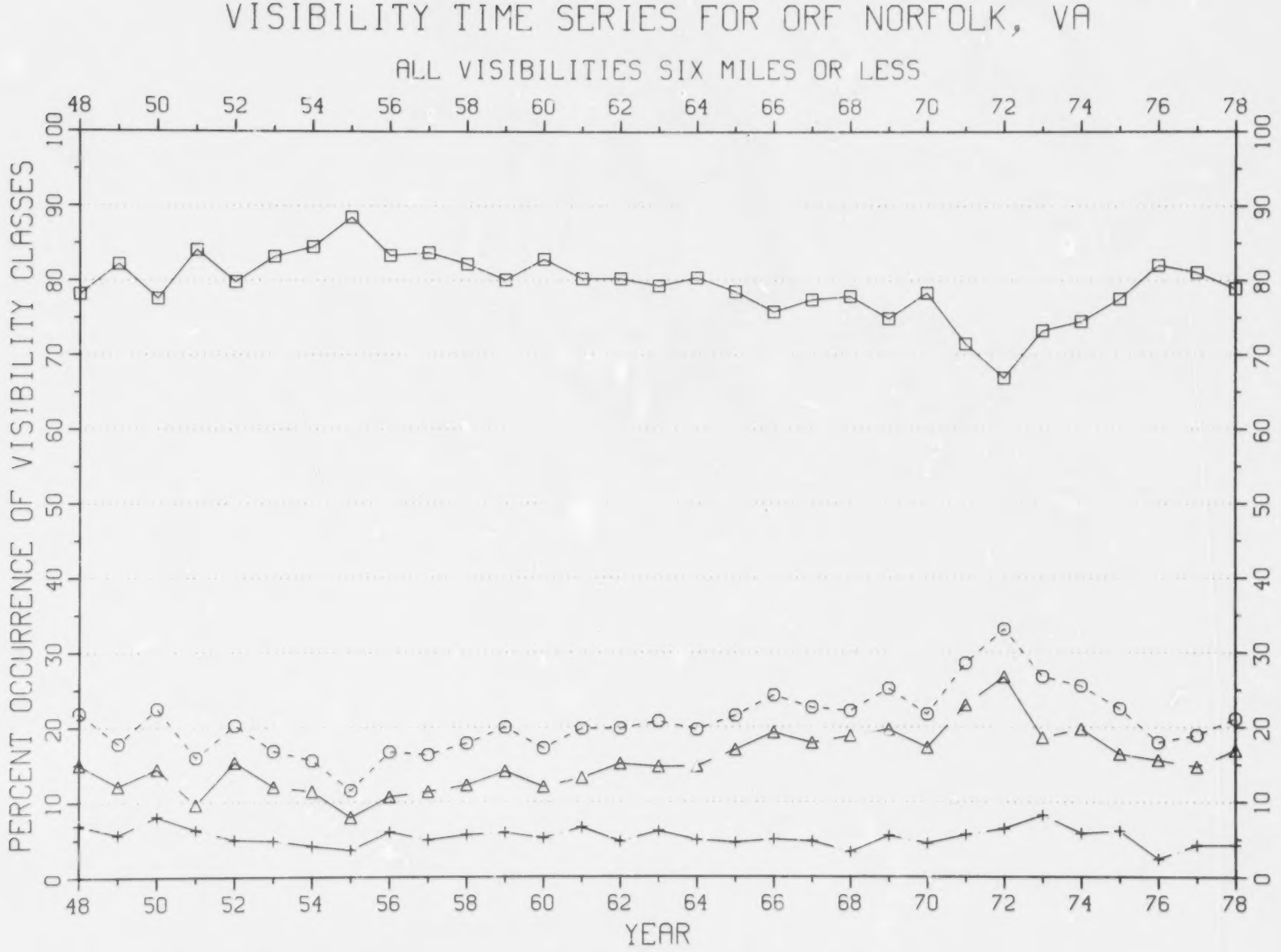

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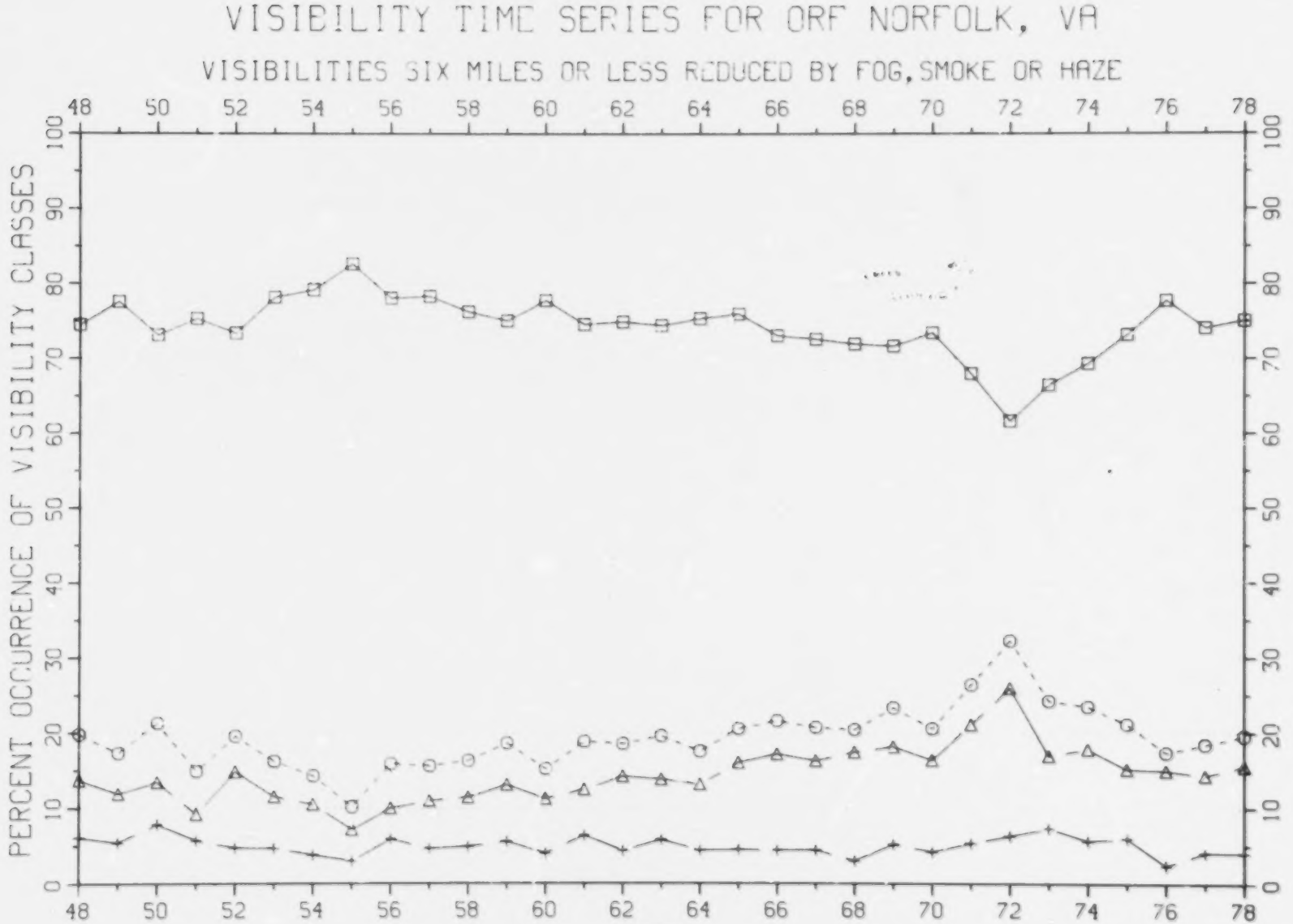

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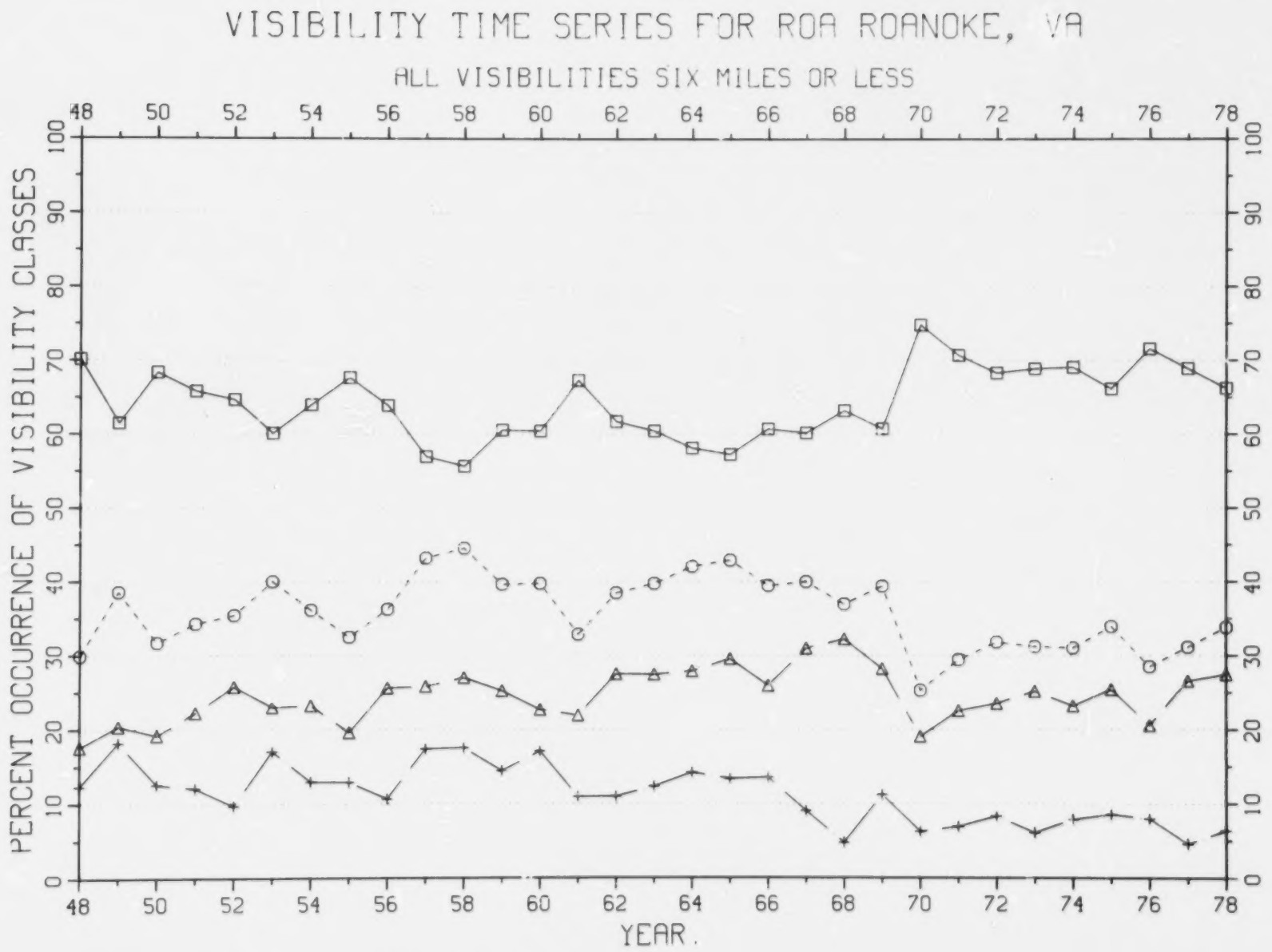
VISIBILITY TIME SERIES FOR ROA ROANOKE, VA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR.
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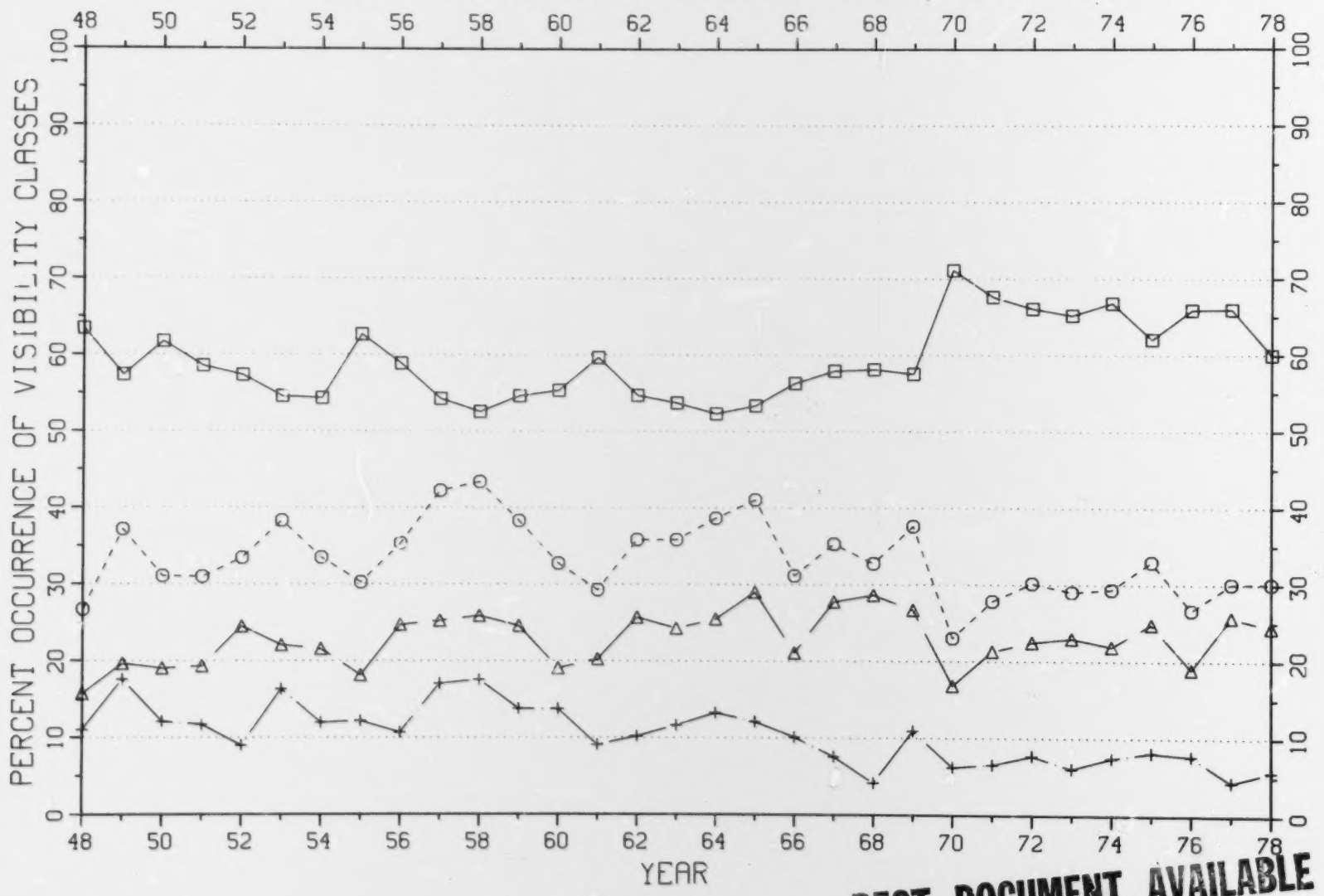

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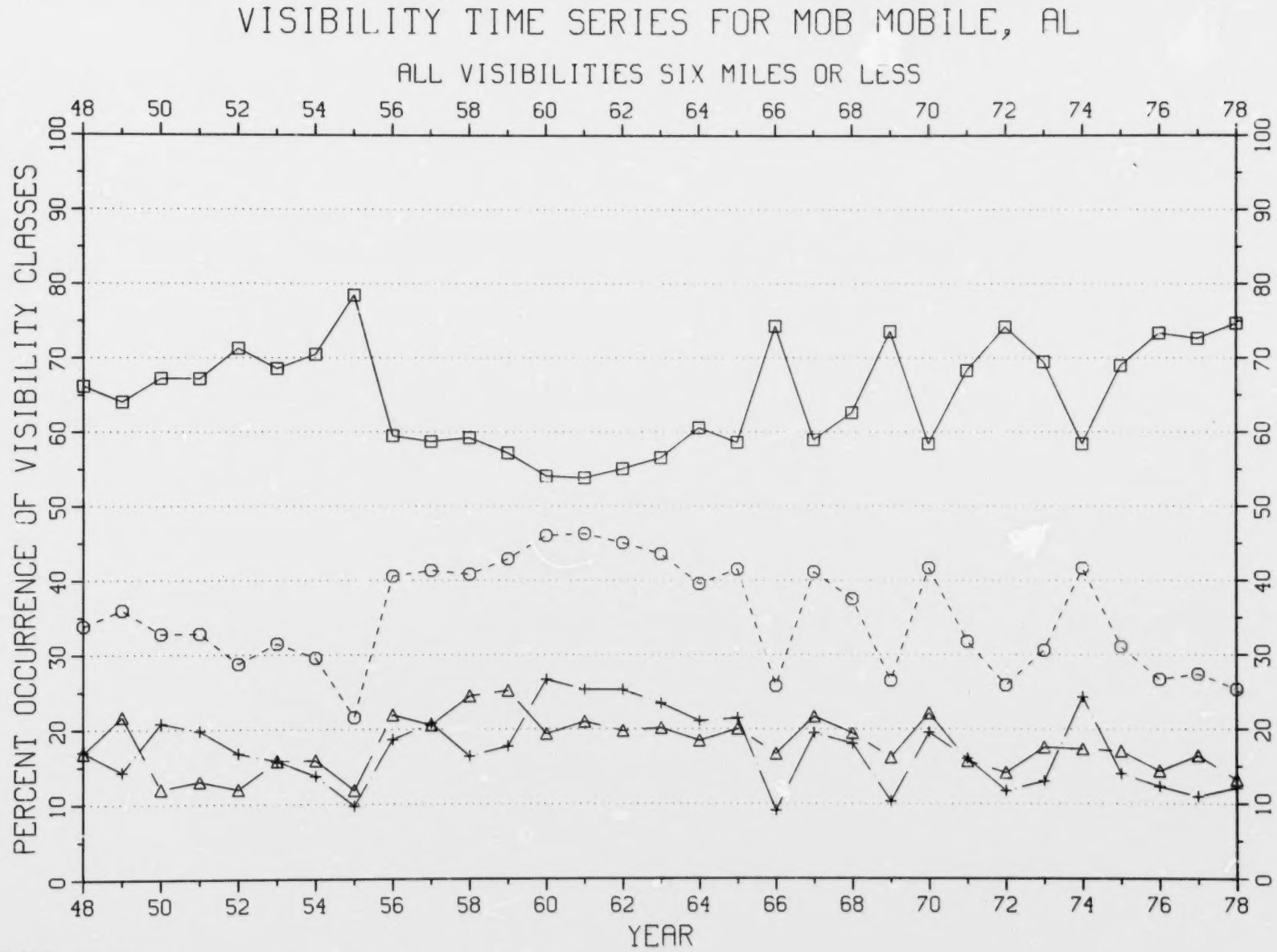

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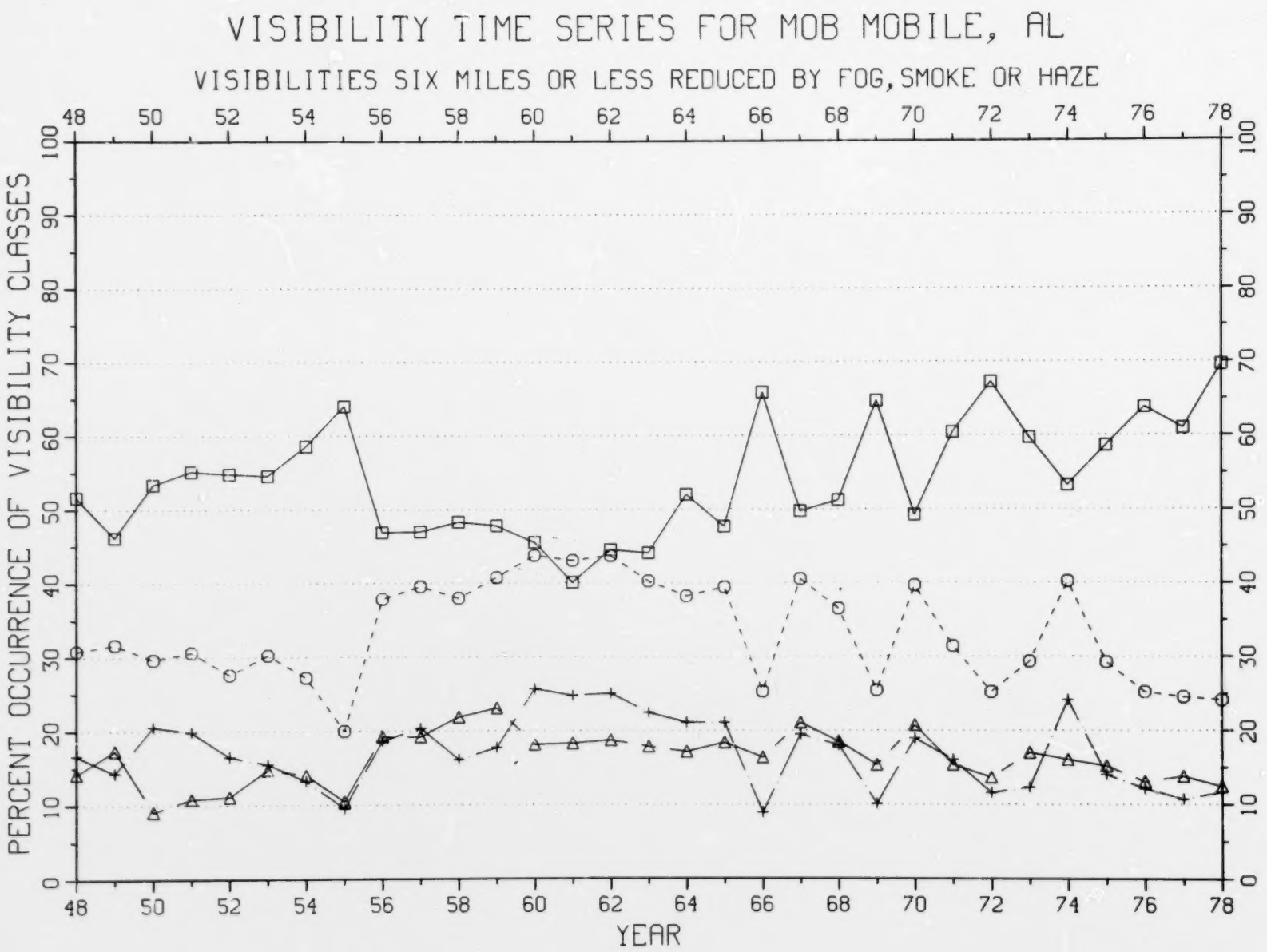

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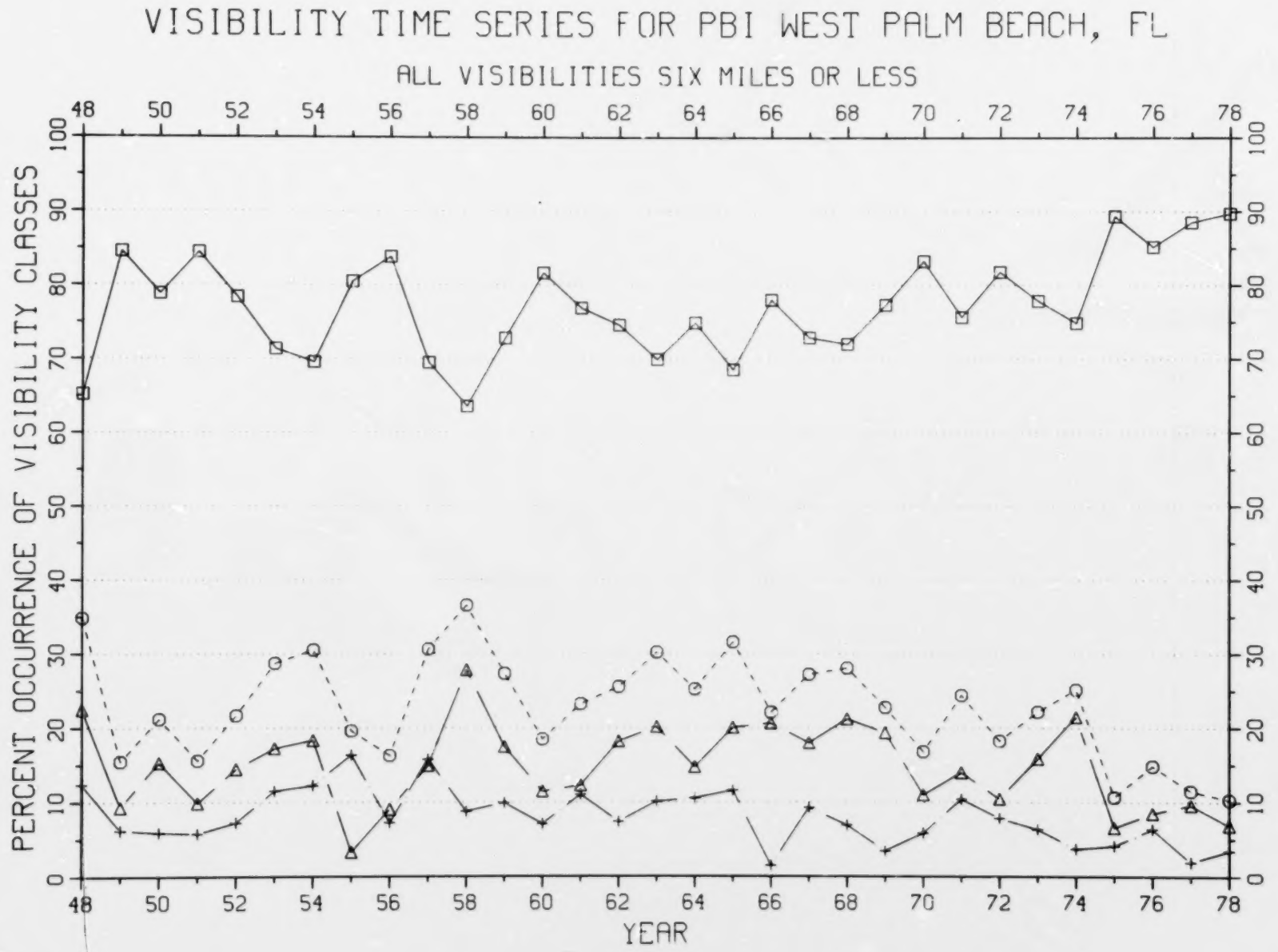

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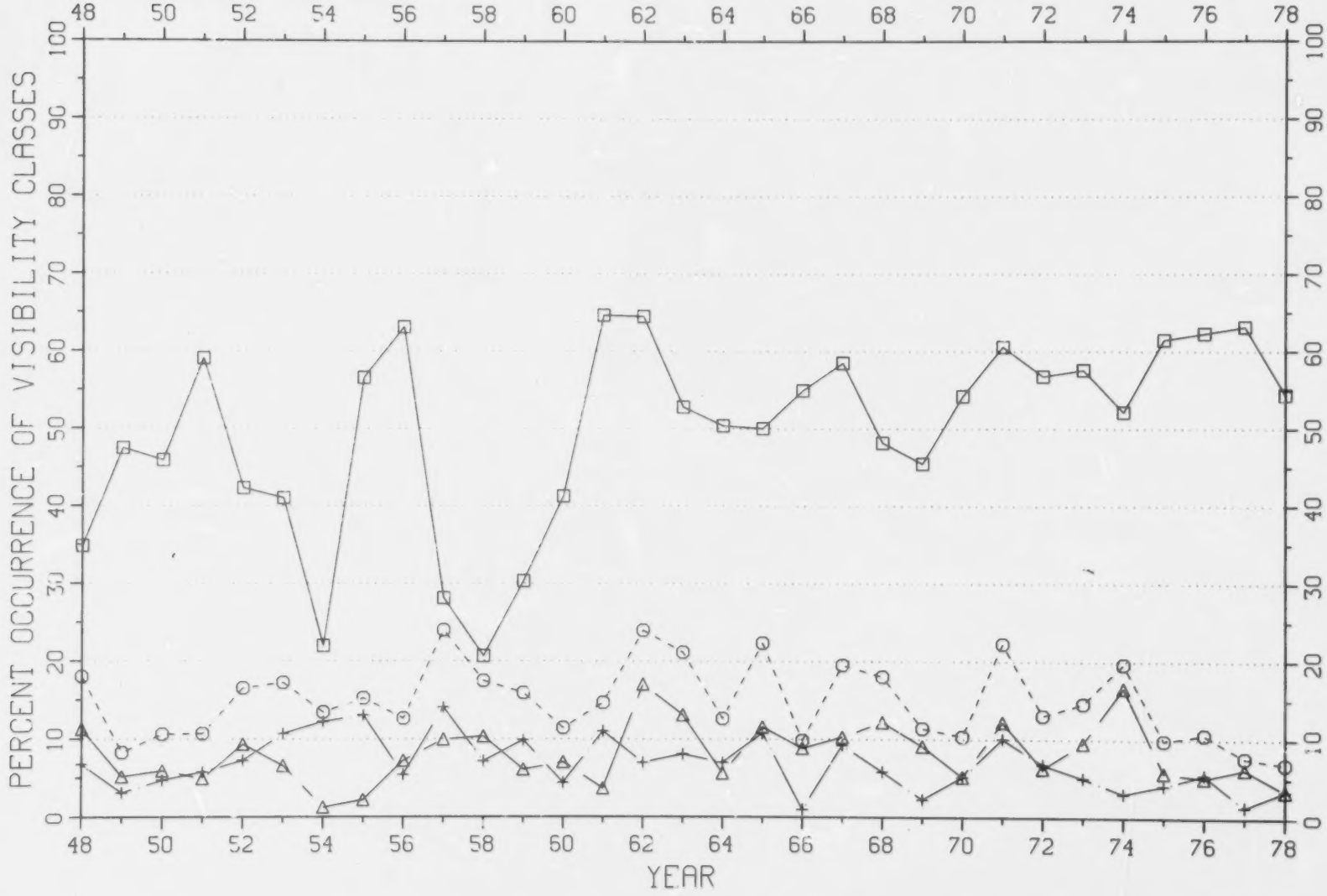
VISIBILITY TIME SERIES FOR PBI WEST PALM BEACH, FL

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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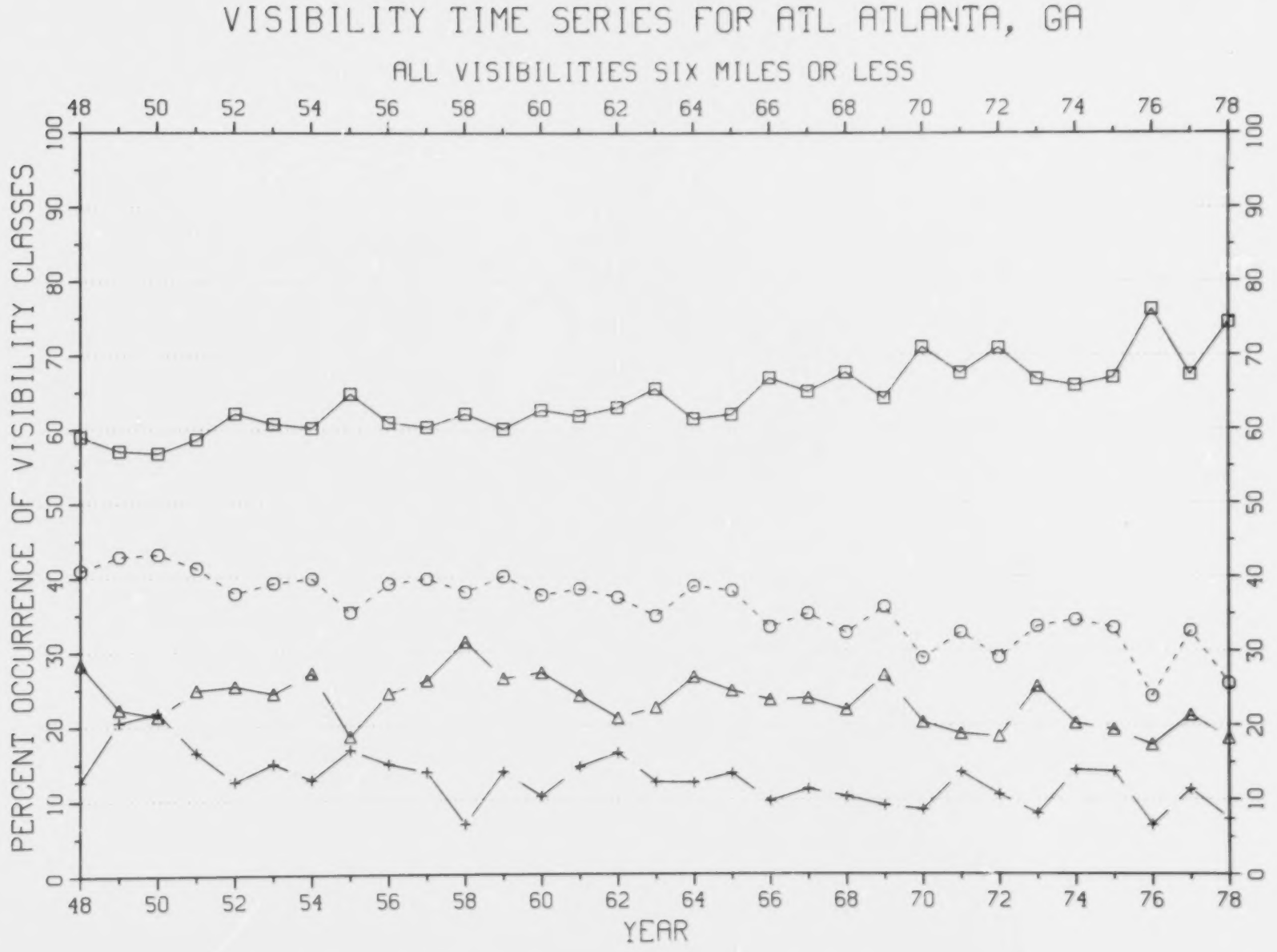

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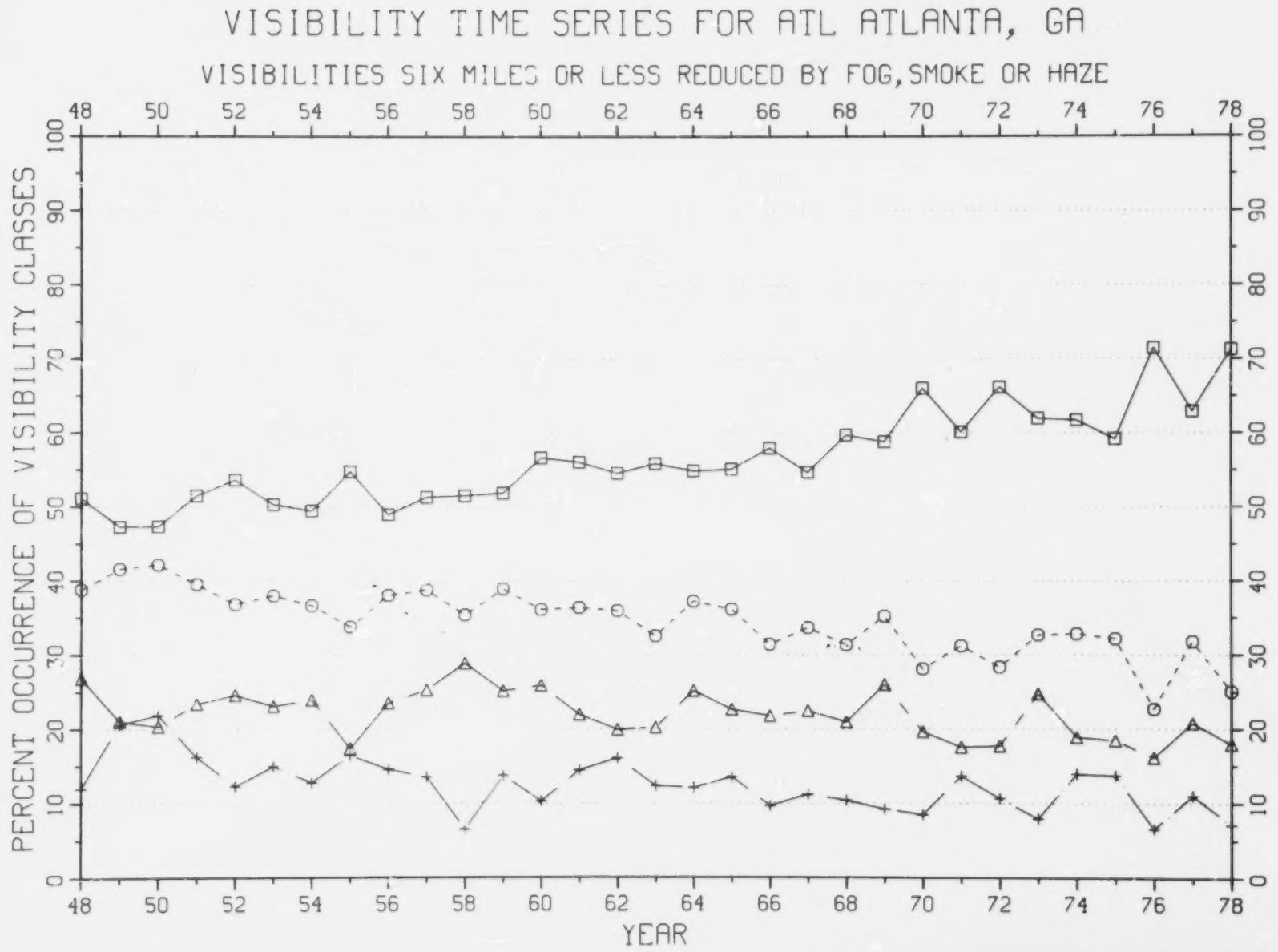
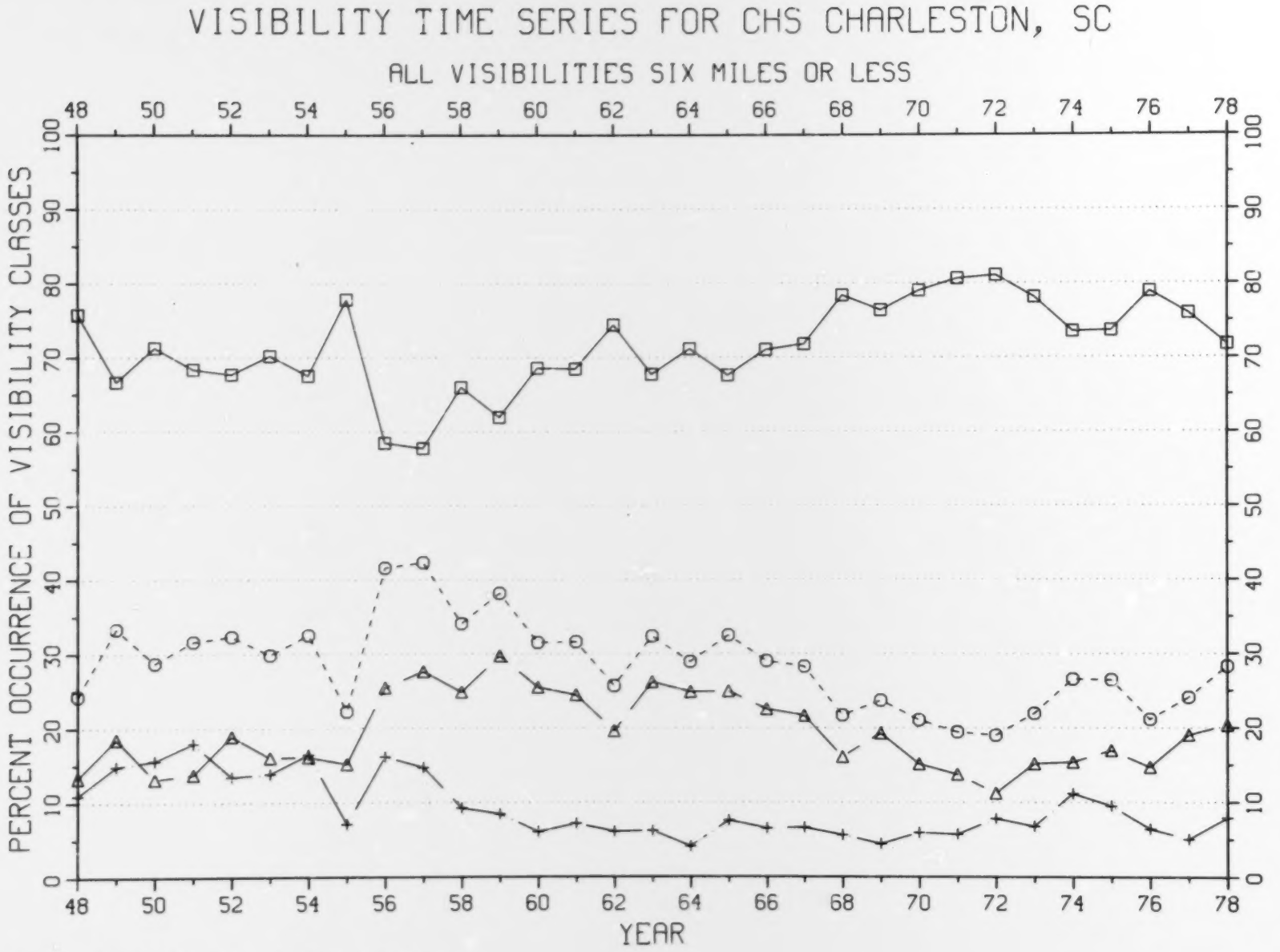

VISIBILITY TIME SERIES FOR ATL ATLANTA, GA
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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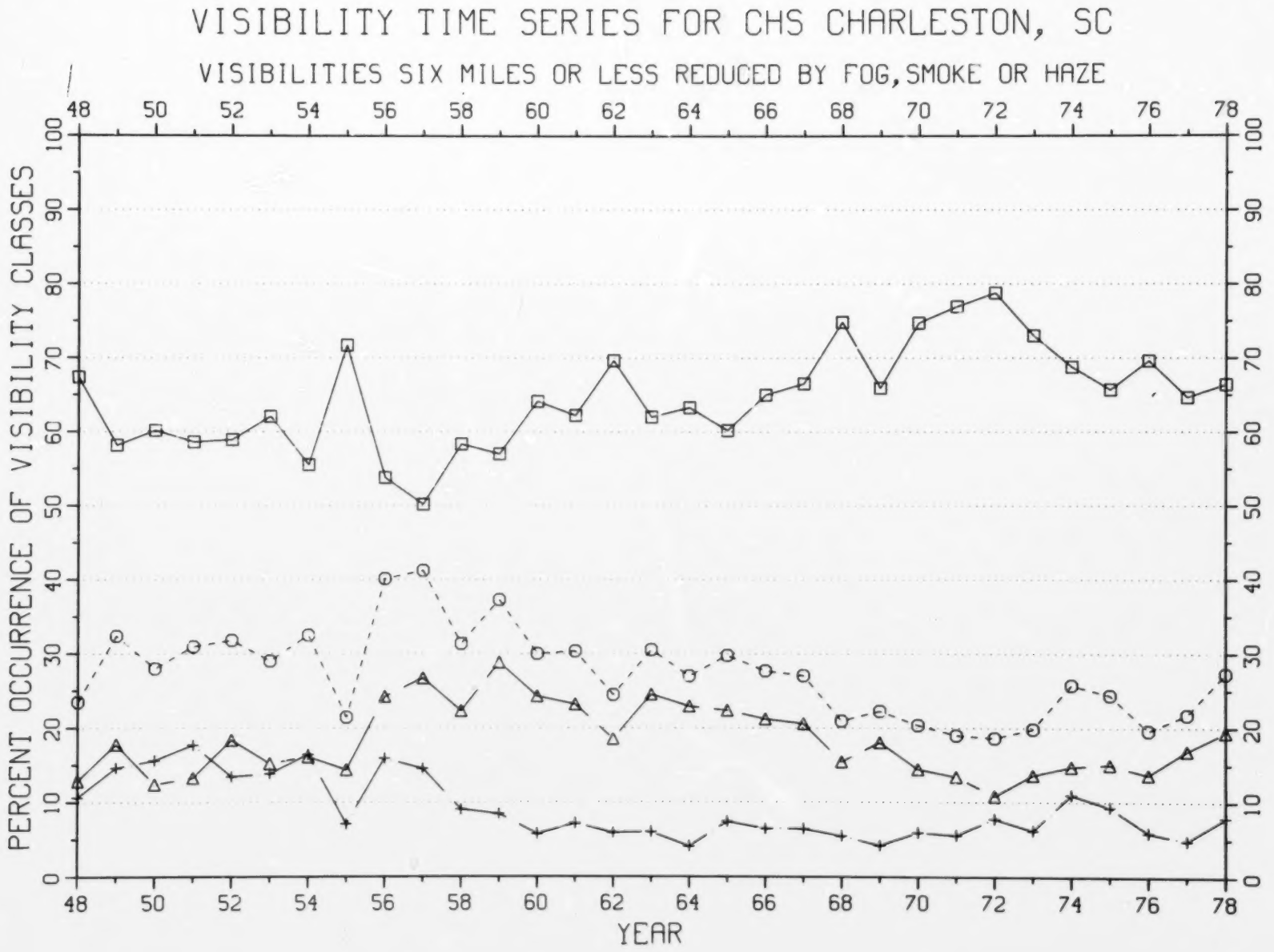

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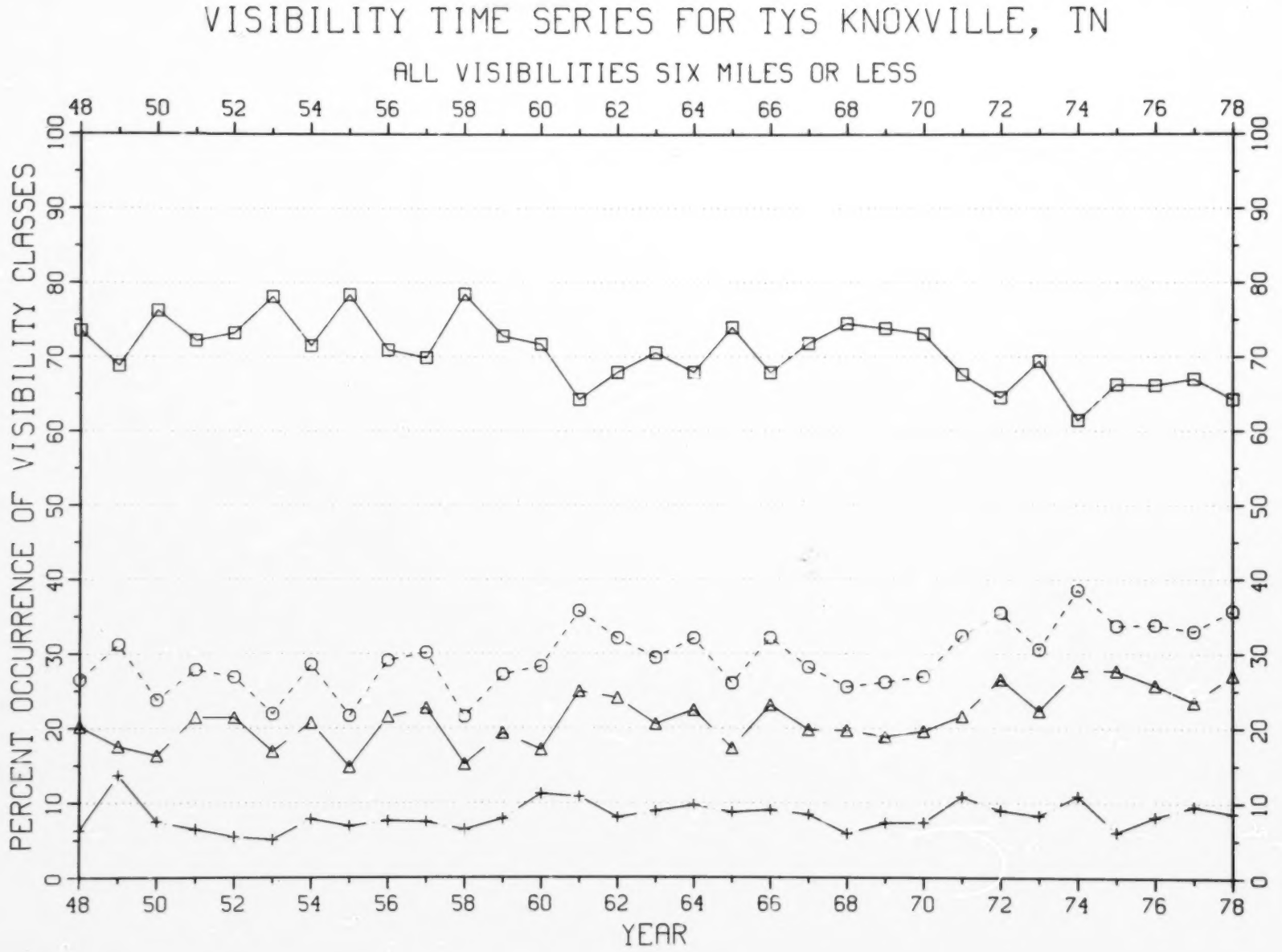

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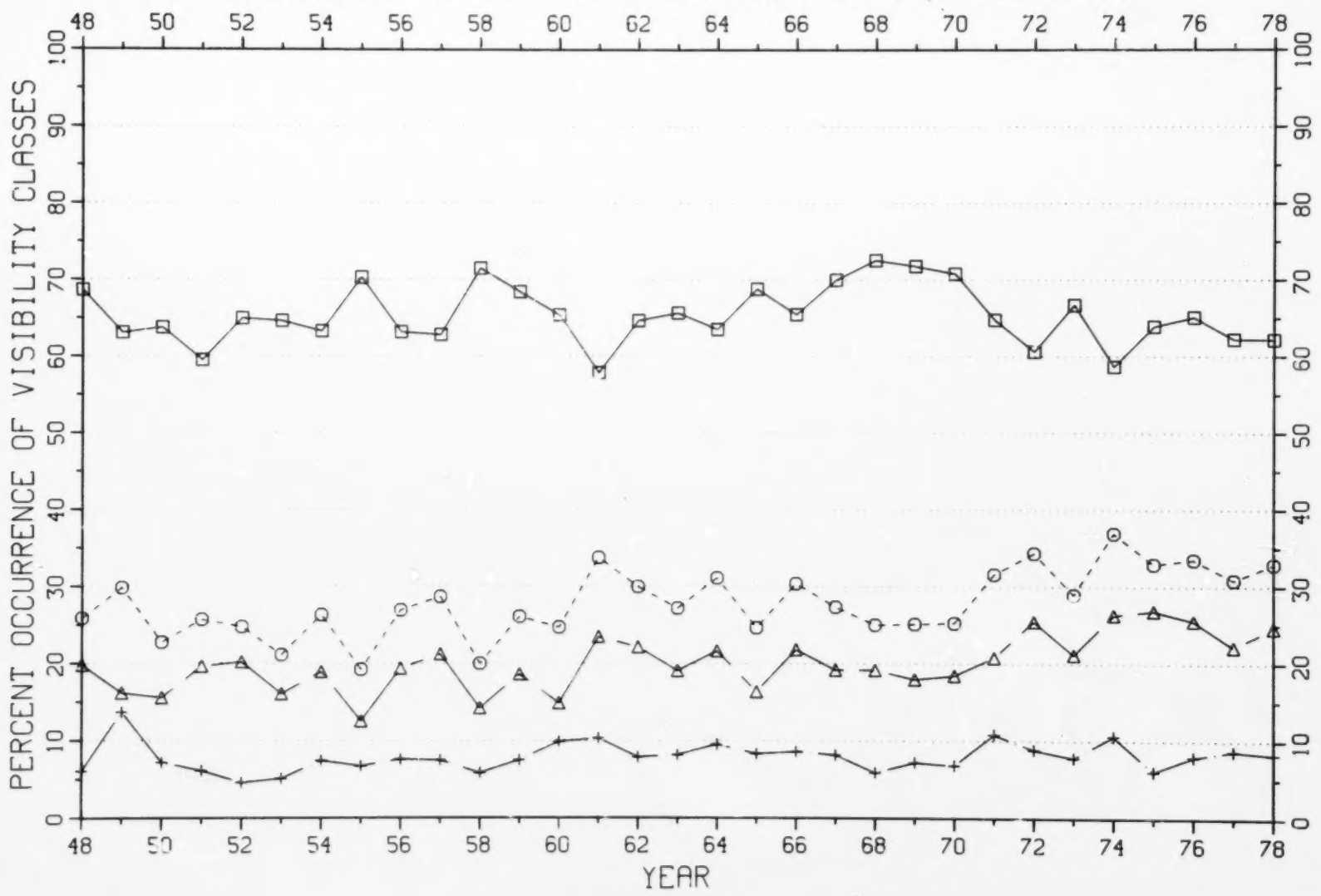

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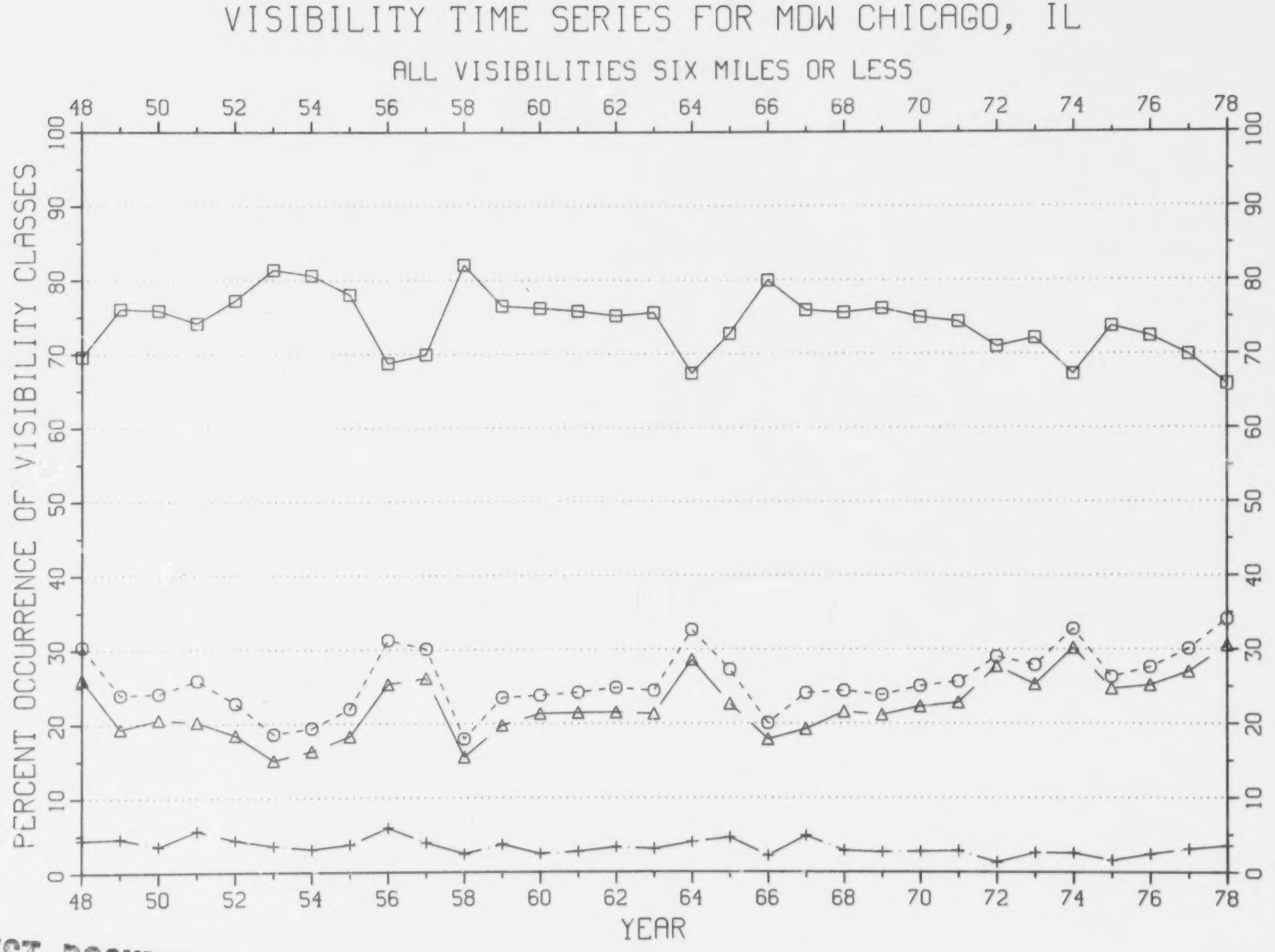

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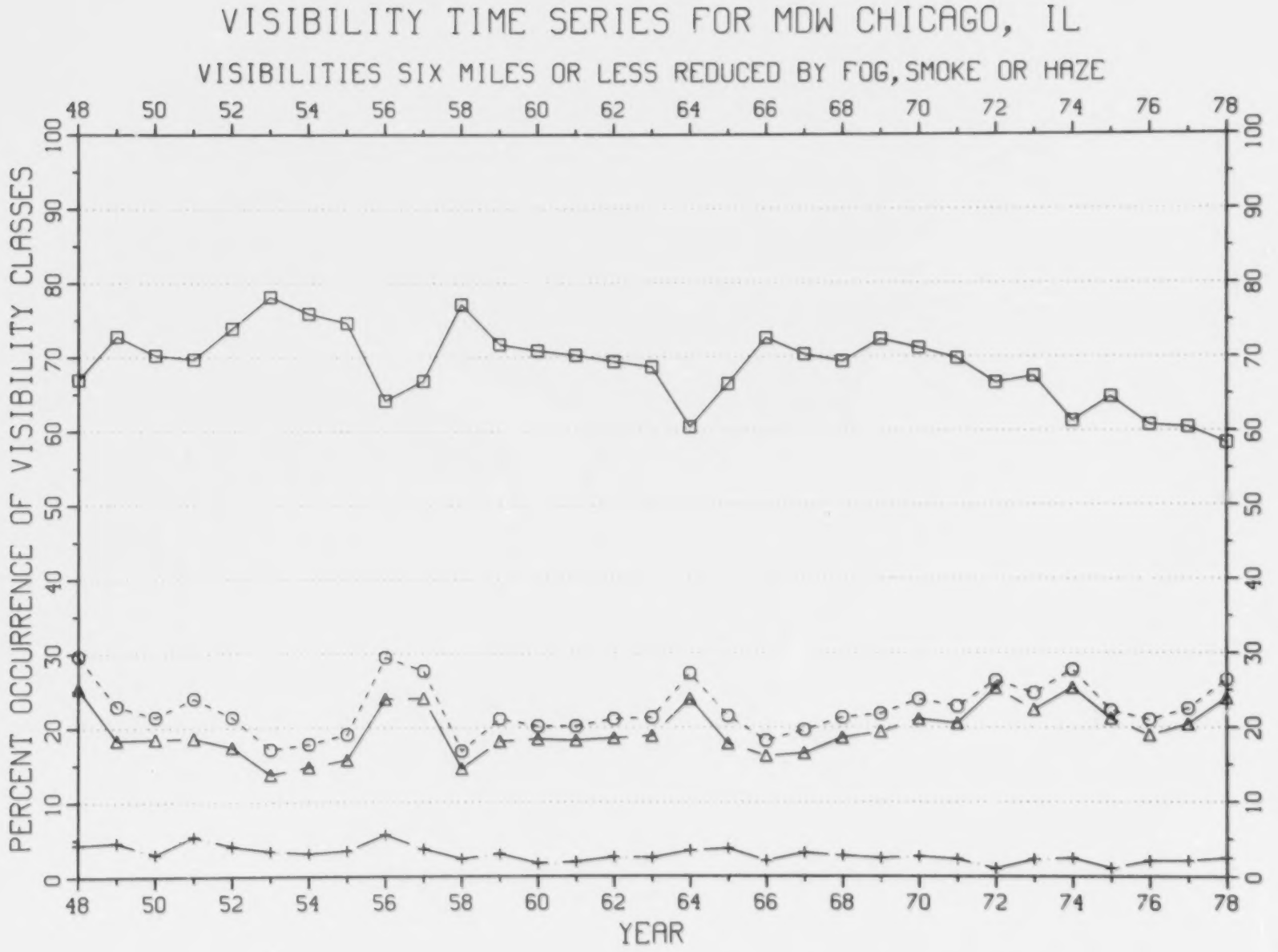

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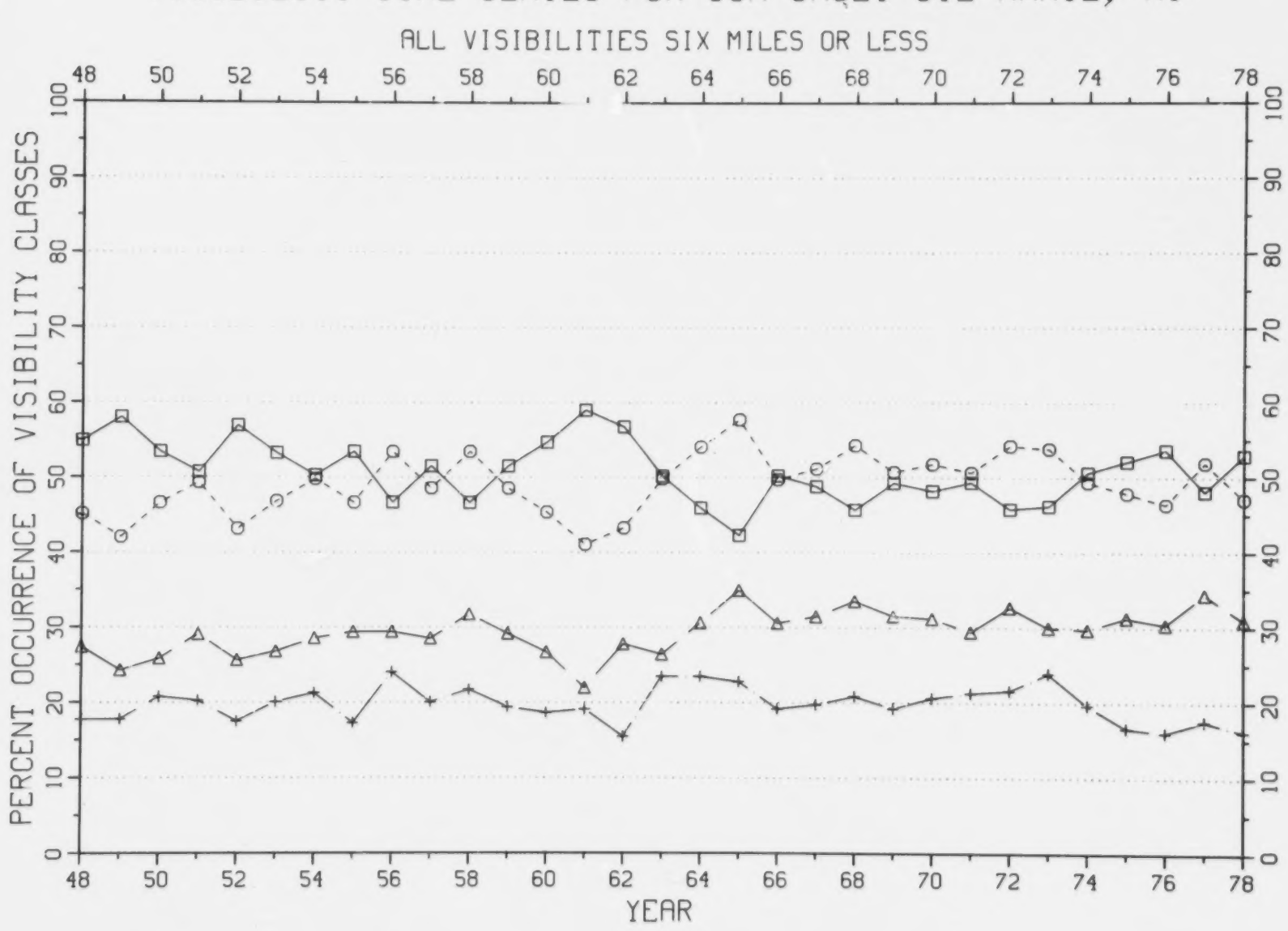

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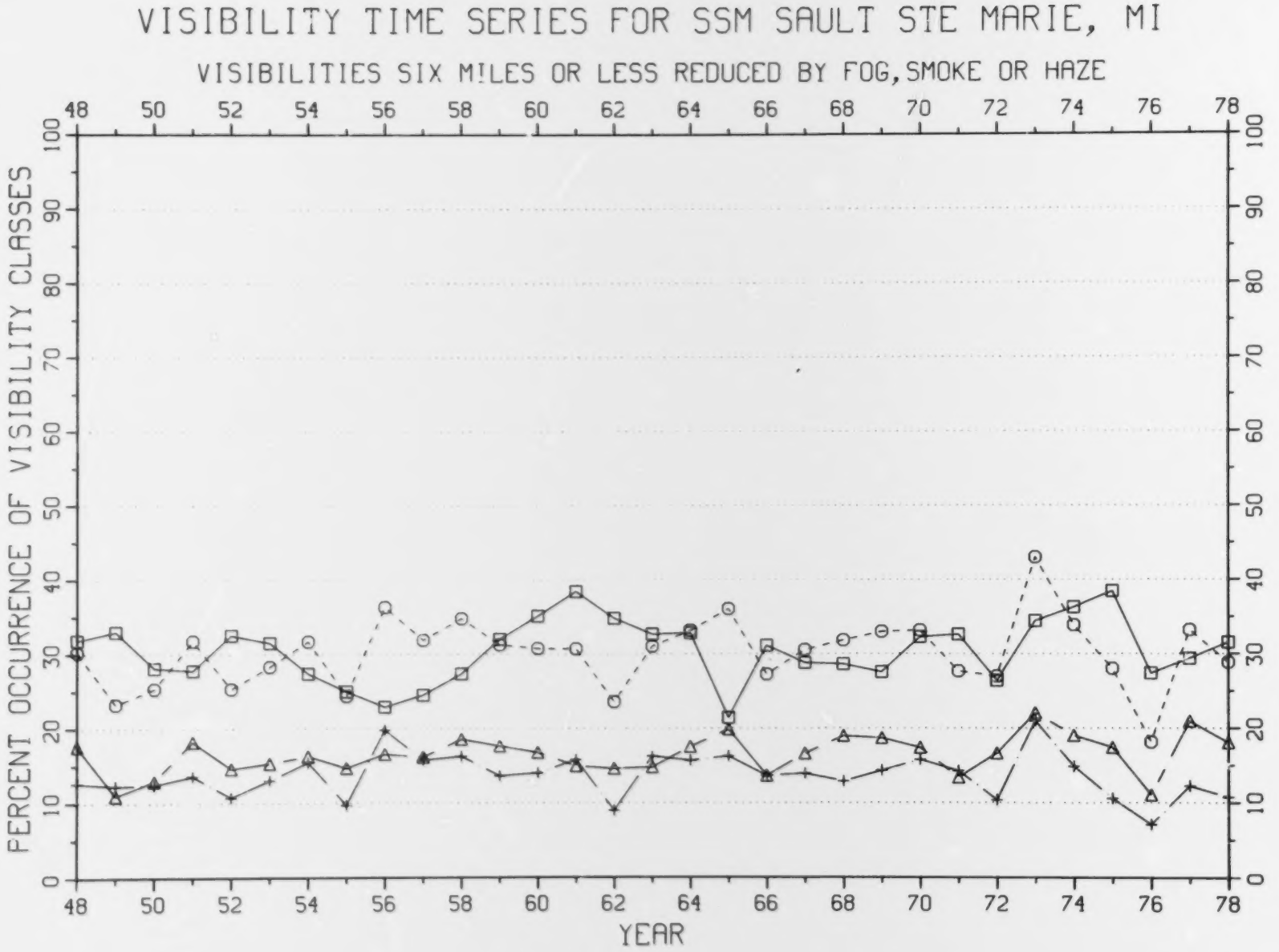
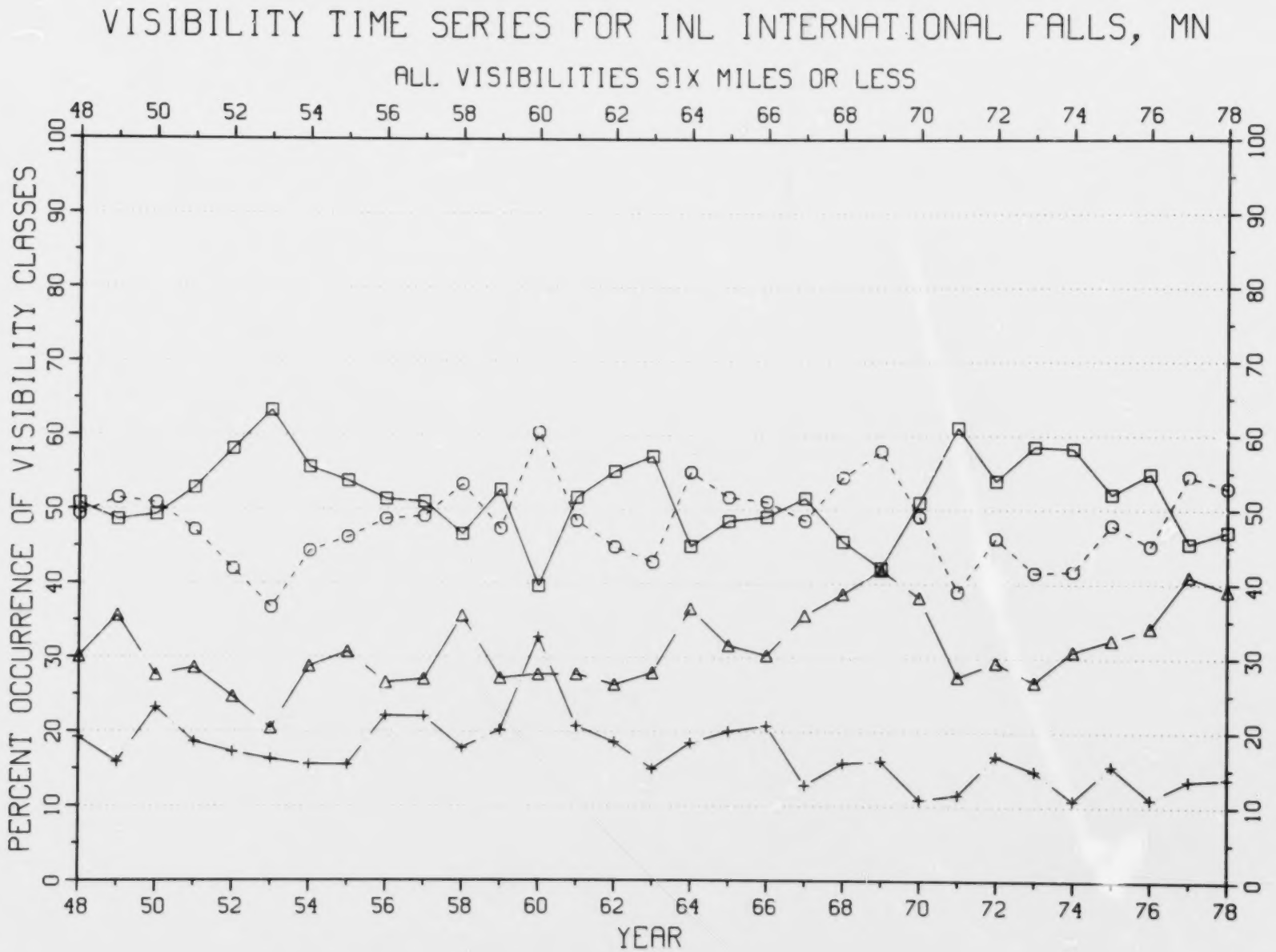

VISIBILITY TIME SERIES FOR SSM SAULT STE MARIE, MI
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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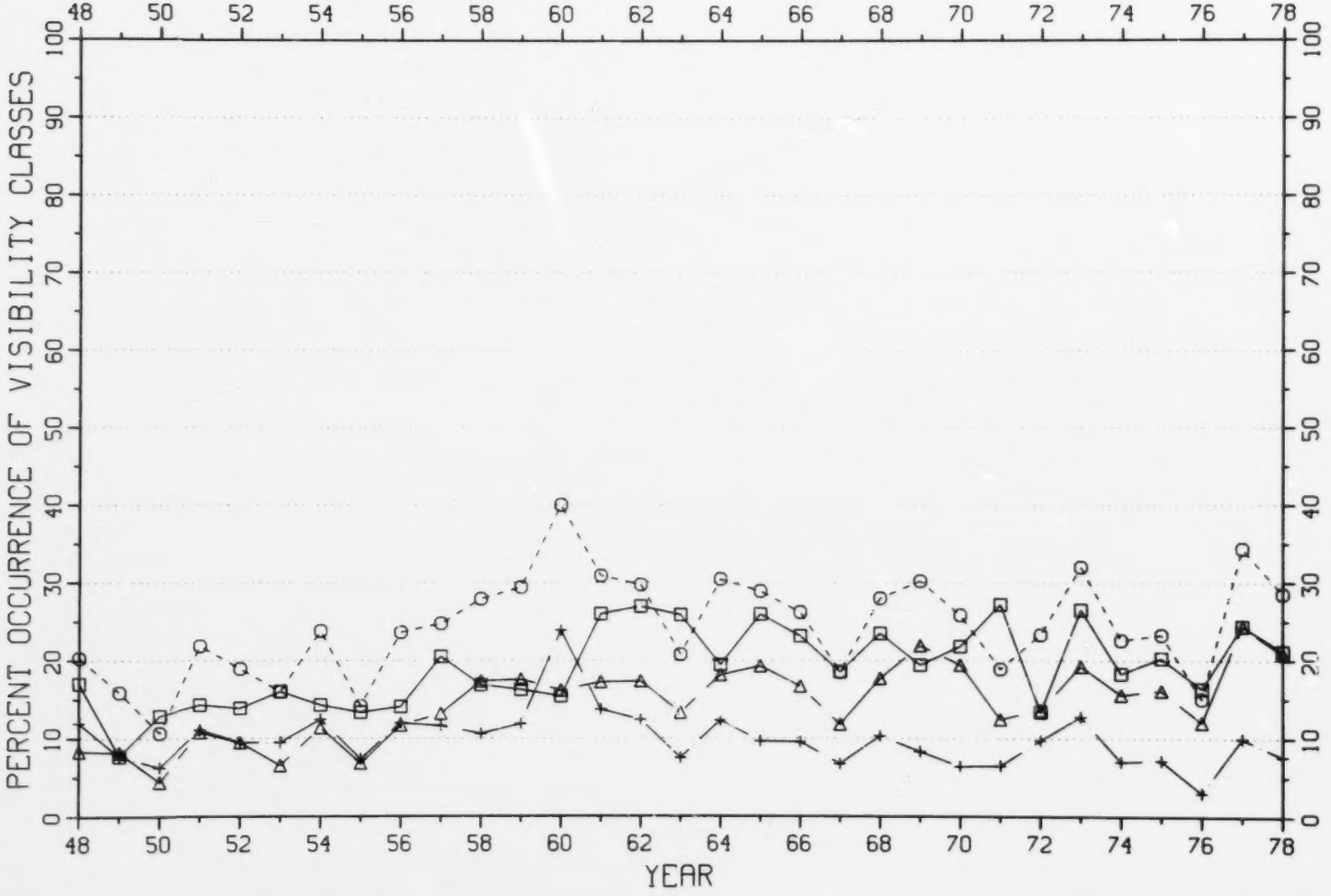
VISIBILITY TIME SERIES FOR INL INTERNATIONAL FALLS, MN

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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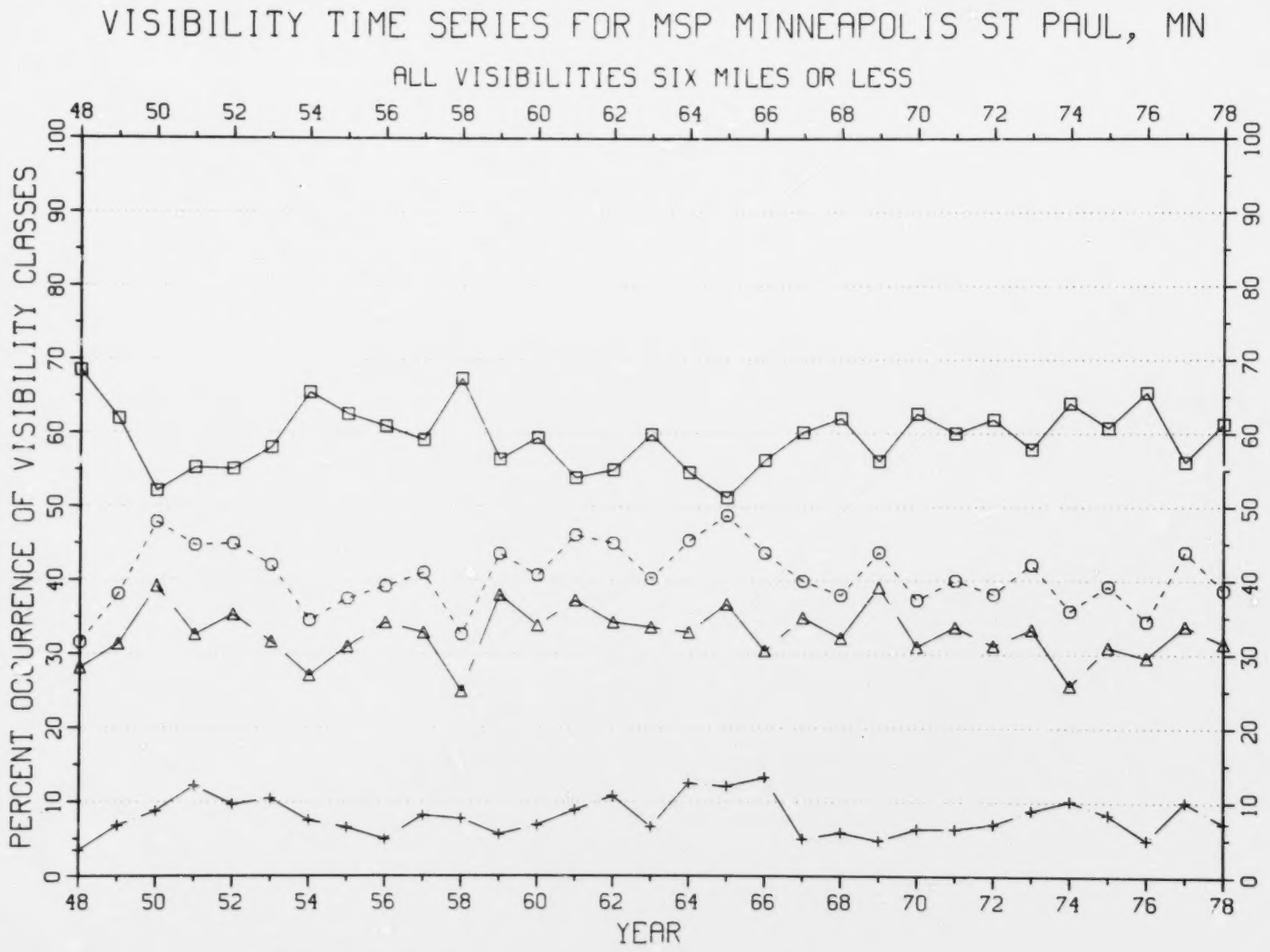

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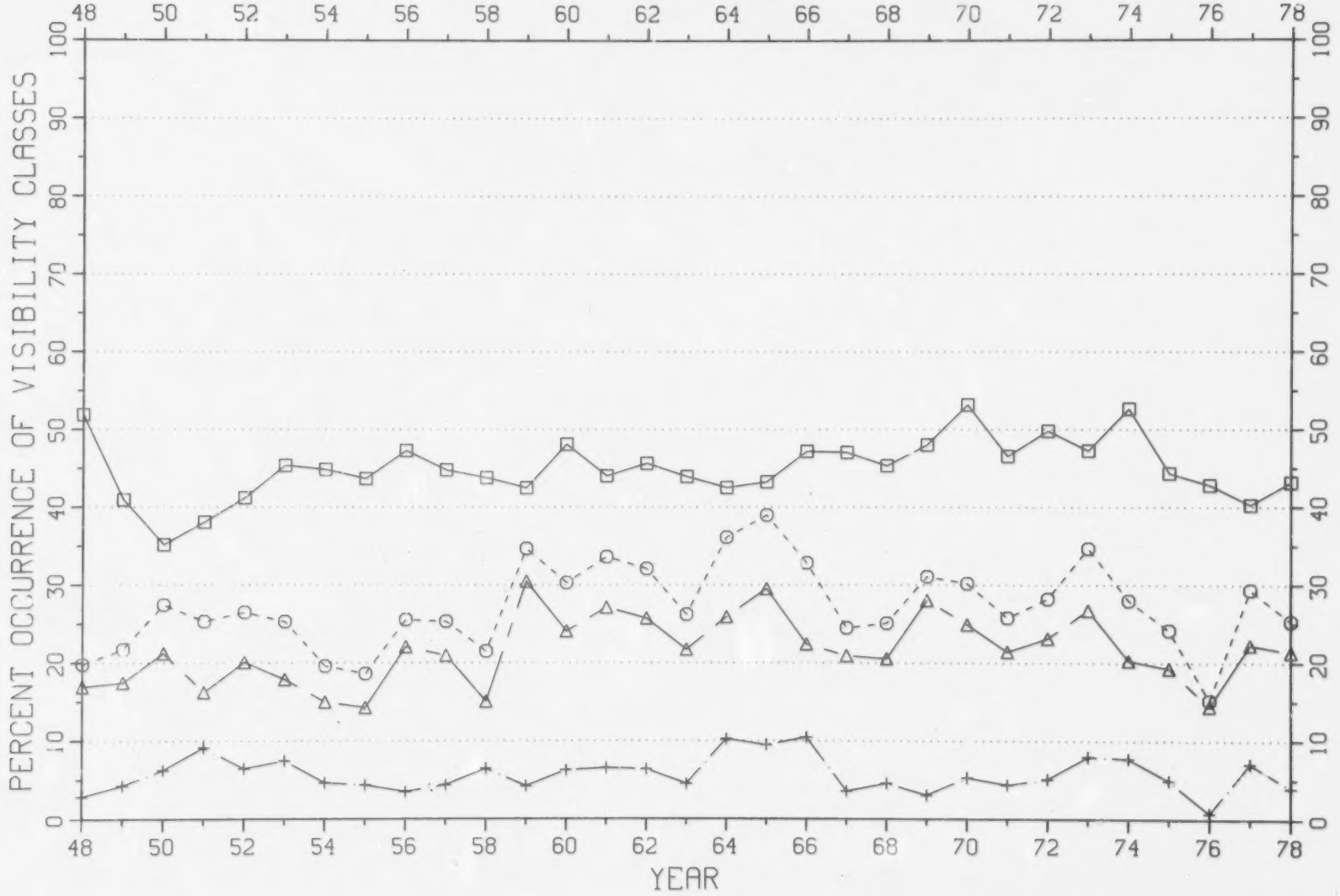
VISIBILITY TIME SERIES FOR MSP MINNEAPOLIS ST PAUL, MN

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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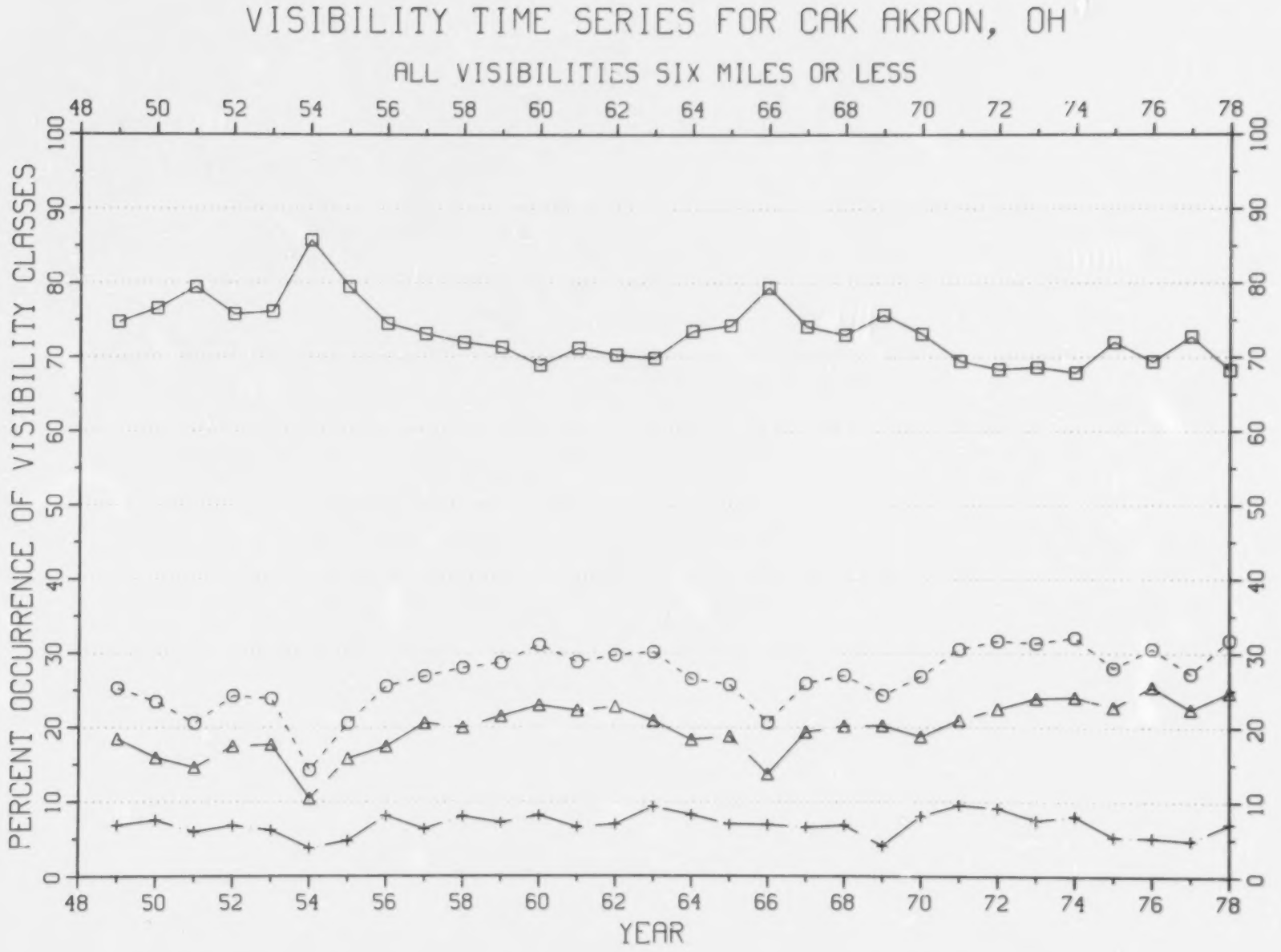

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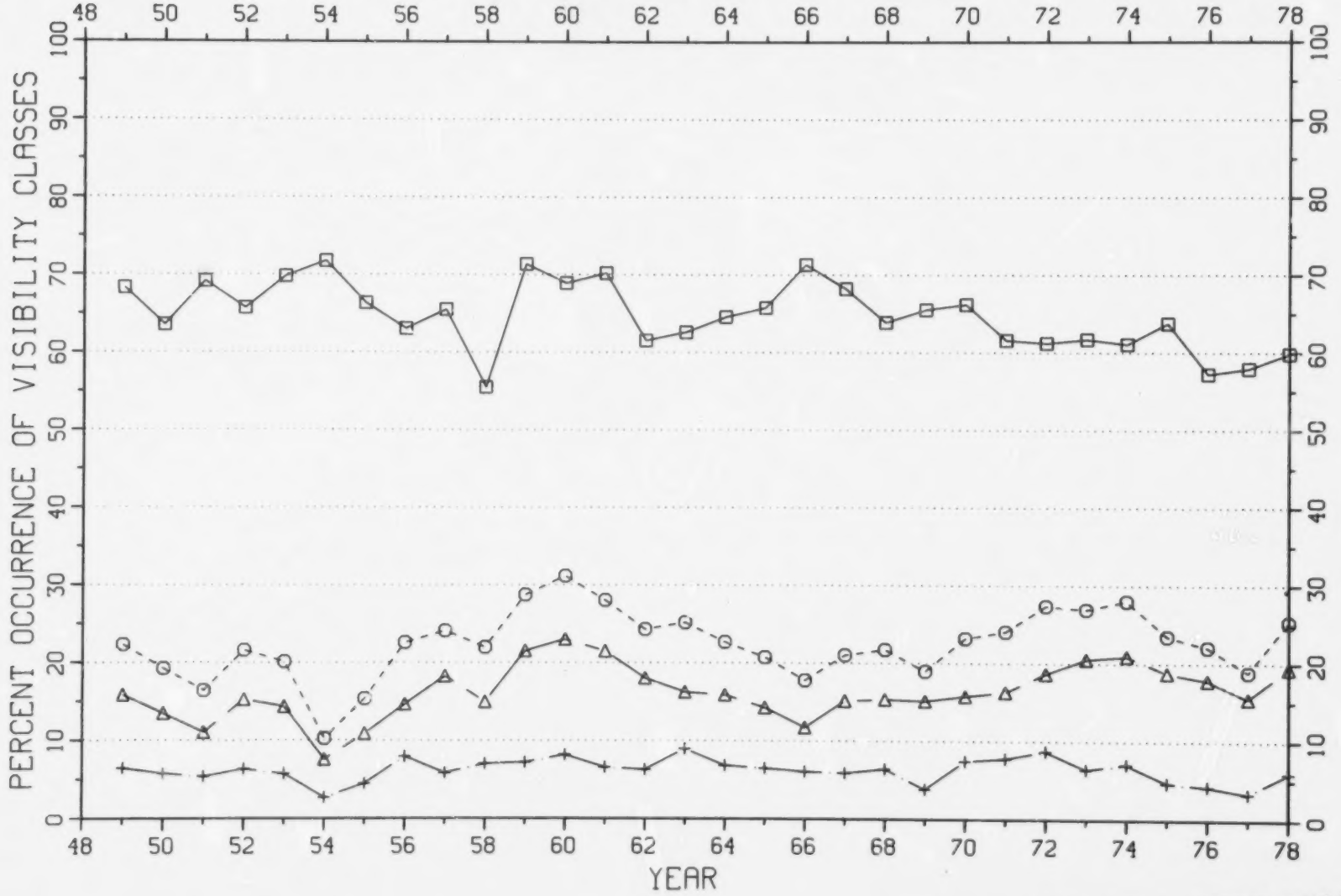
VISIBILITY TIME SERIES FOR CAK AKRON, OH

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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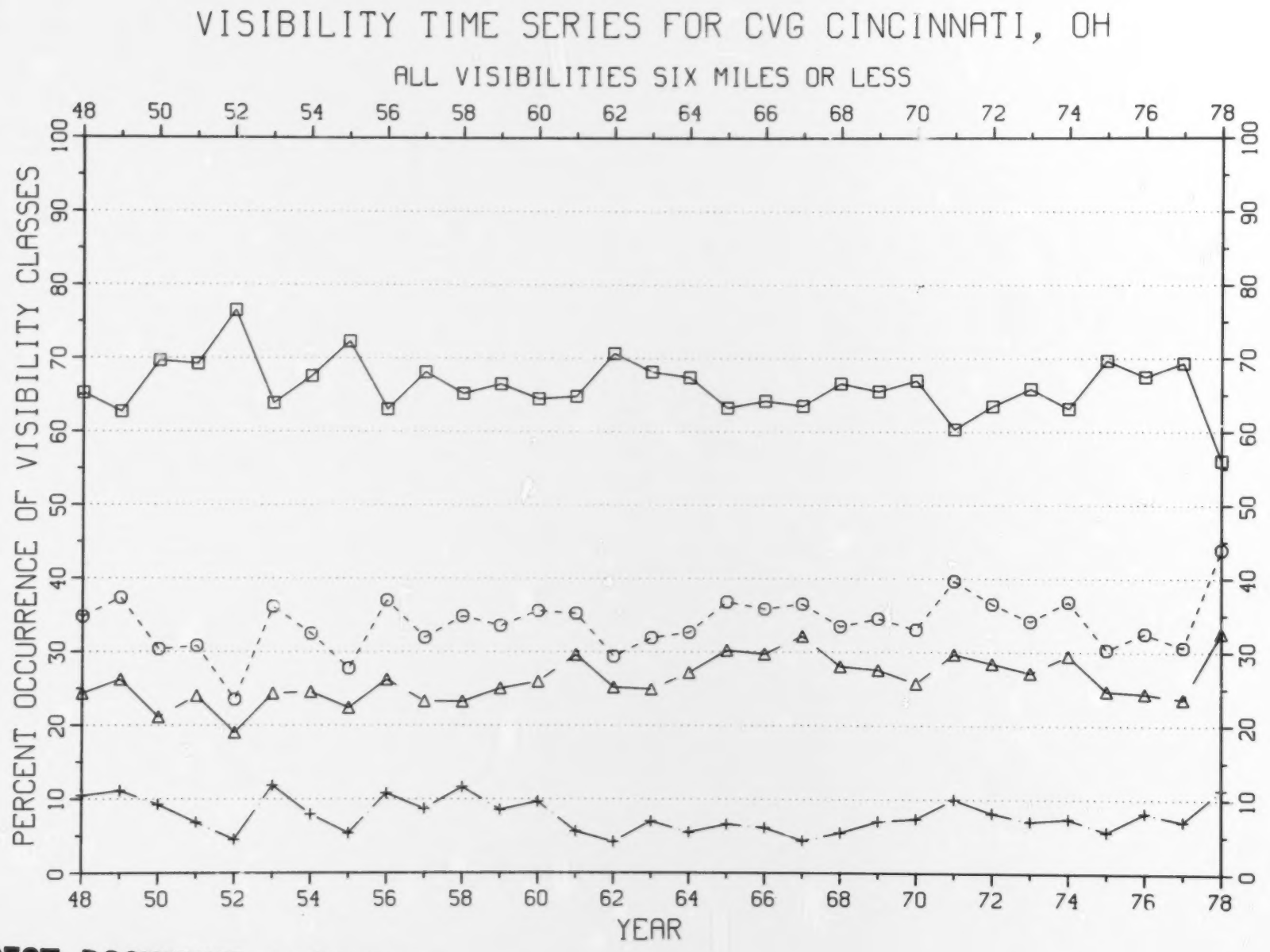

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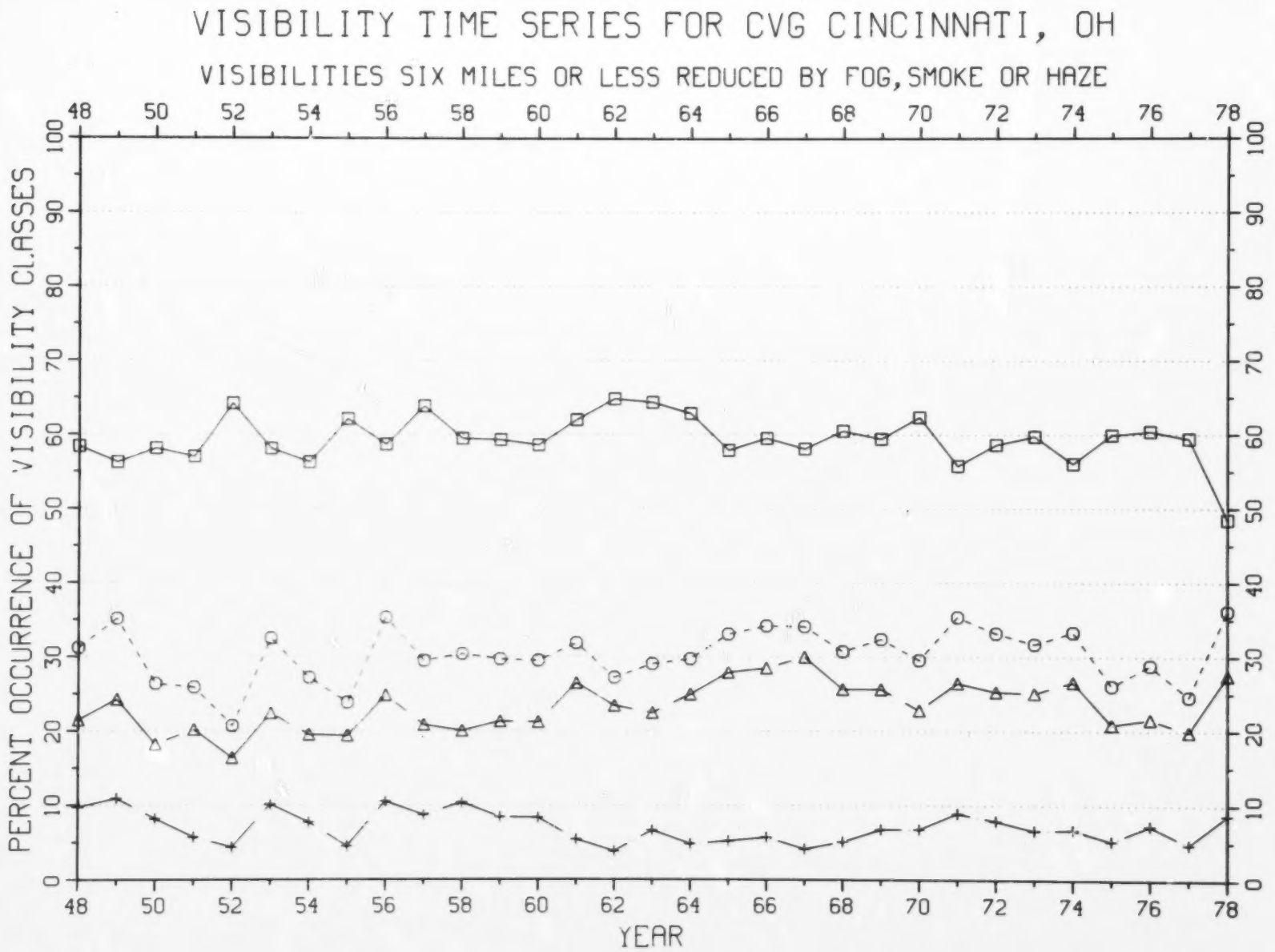

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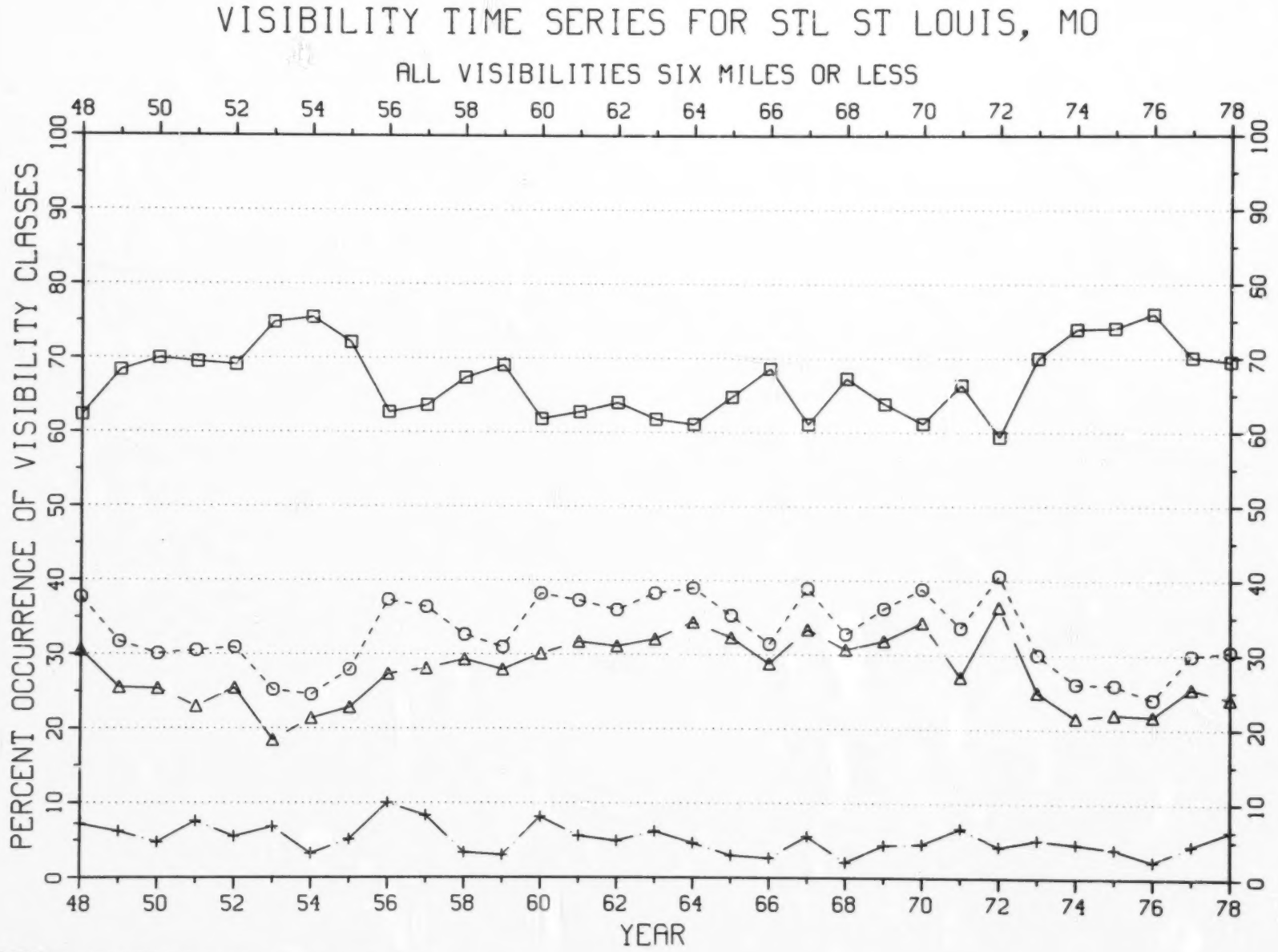

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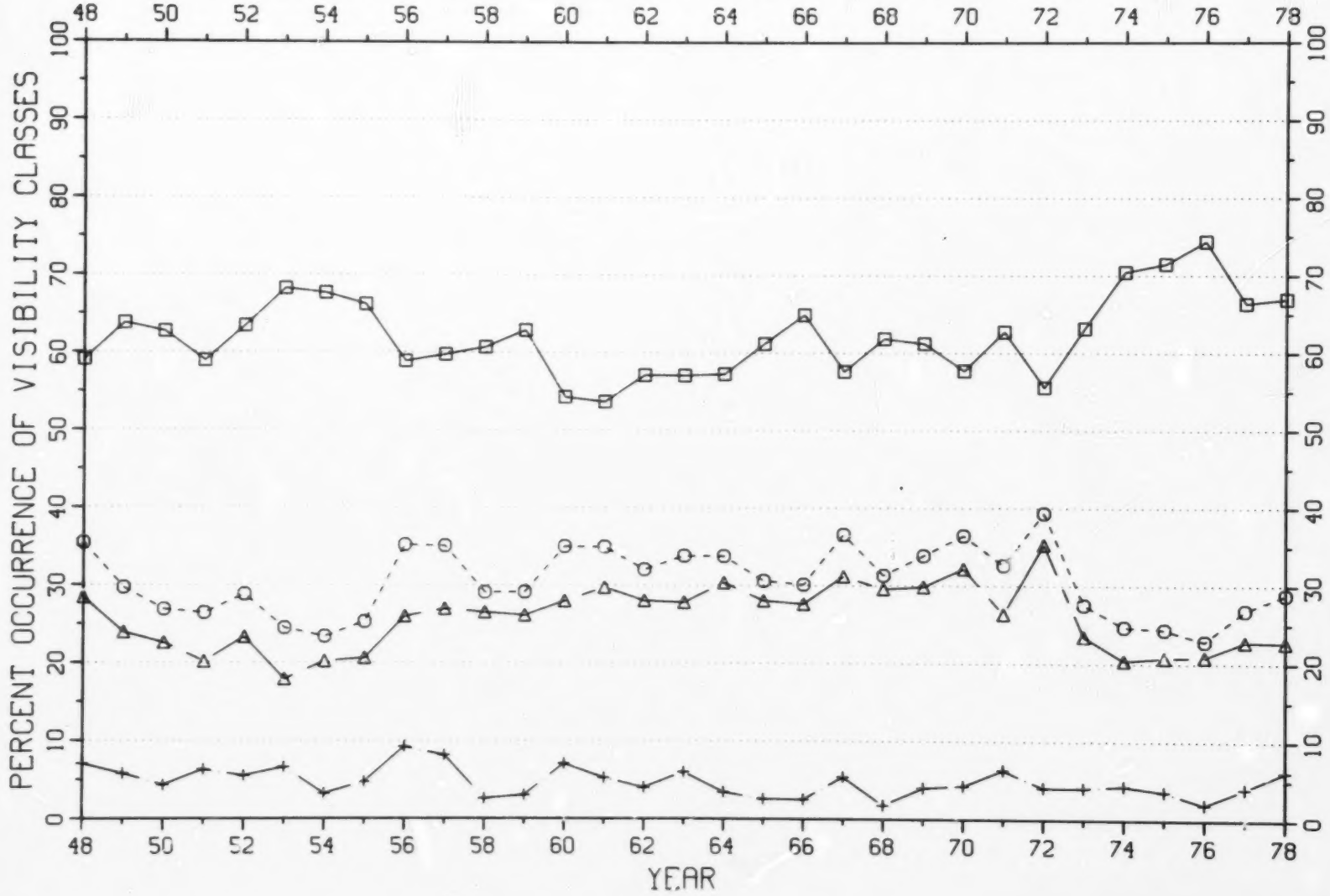
VISIBILITY TIME SERIES FOR STL ST LOUIS, MO

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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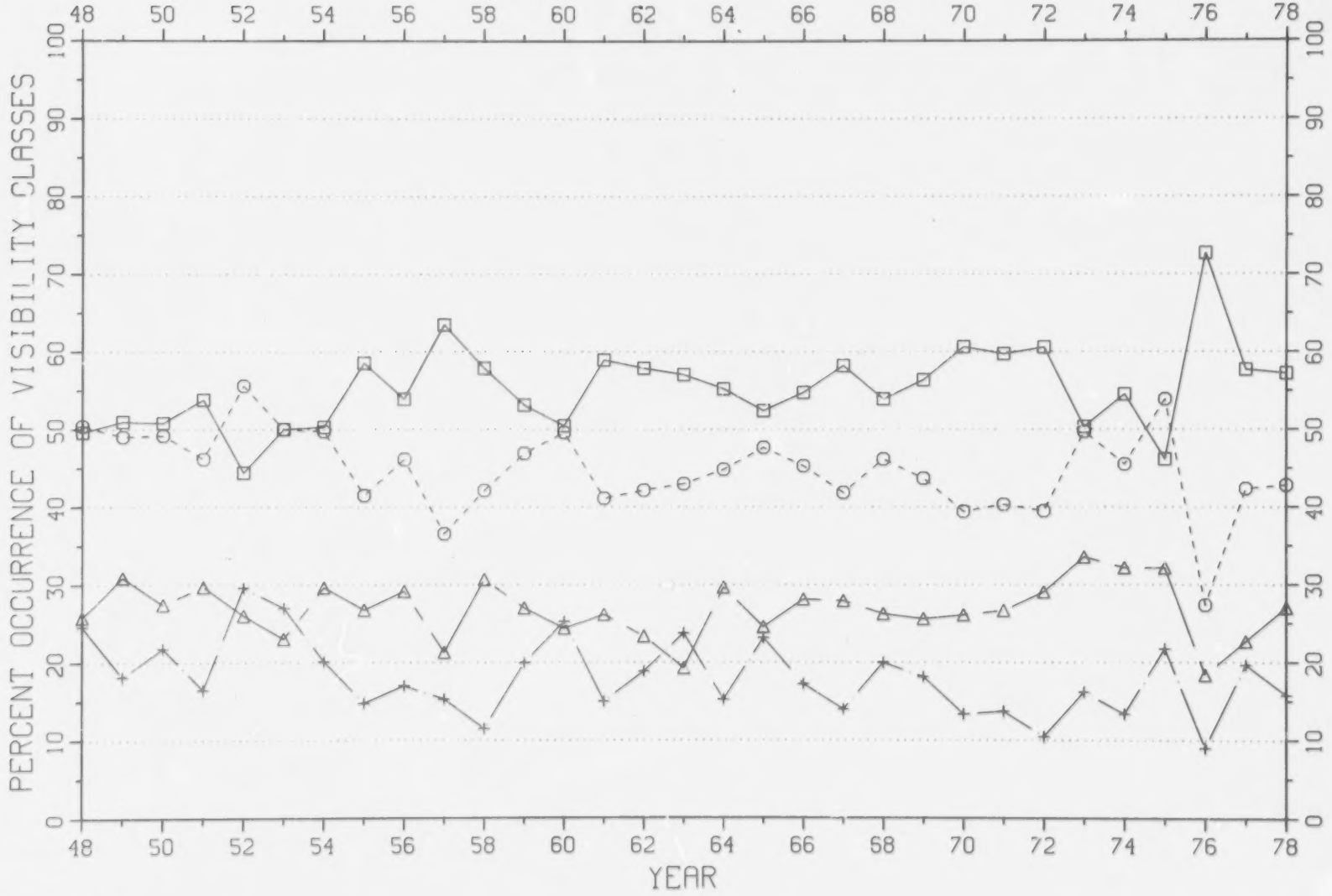

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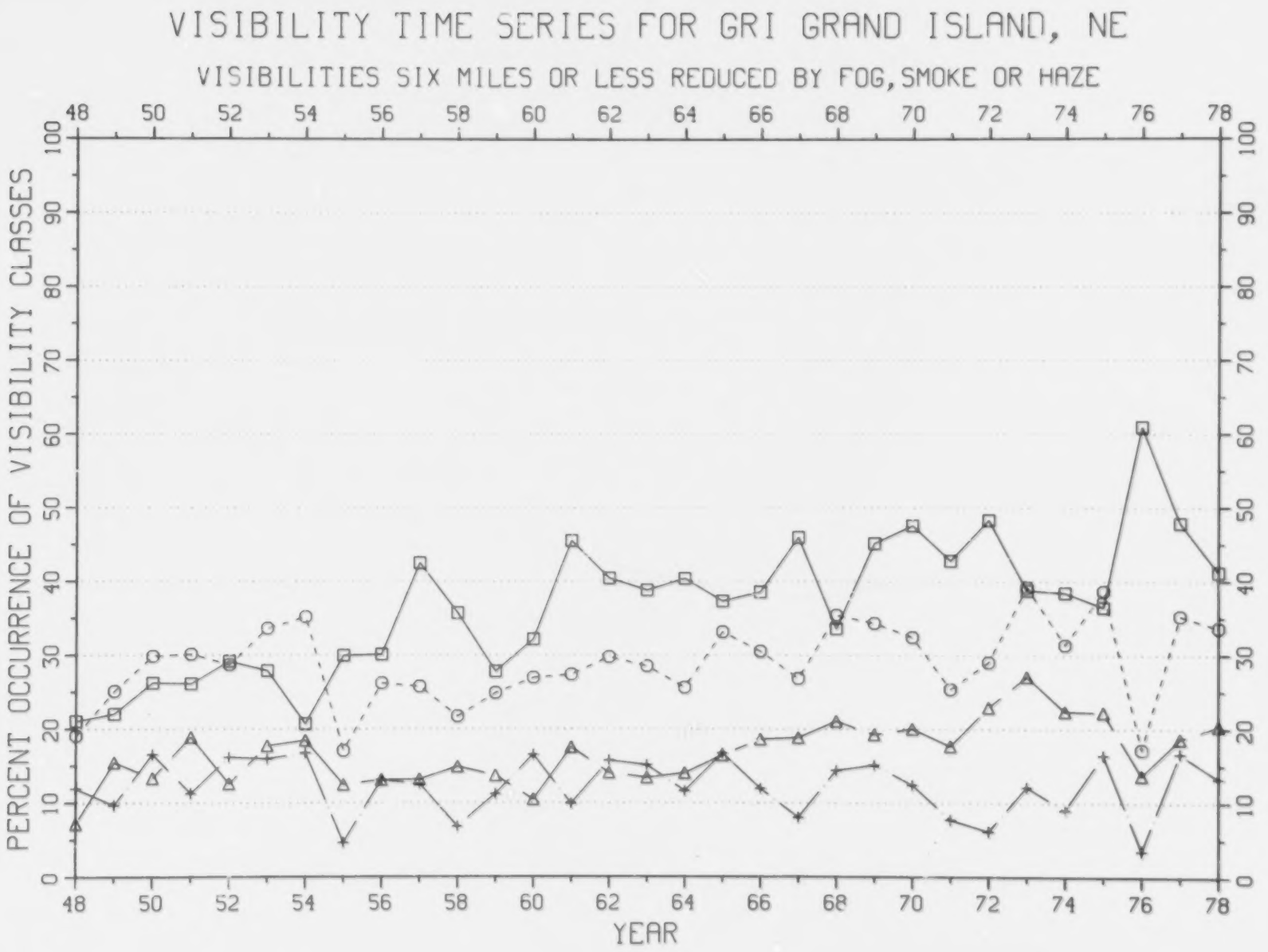

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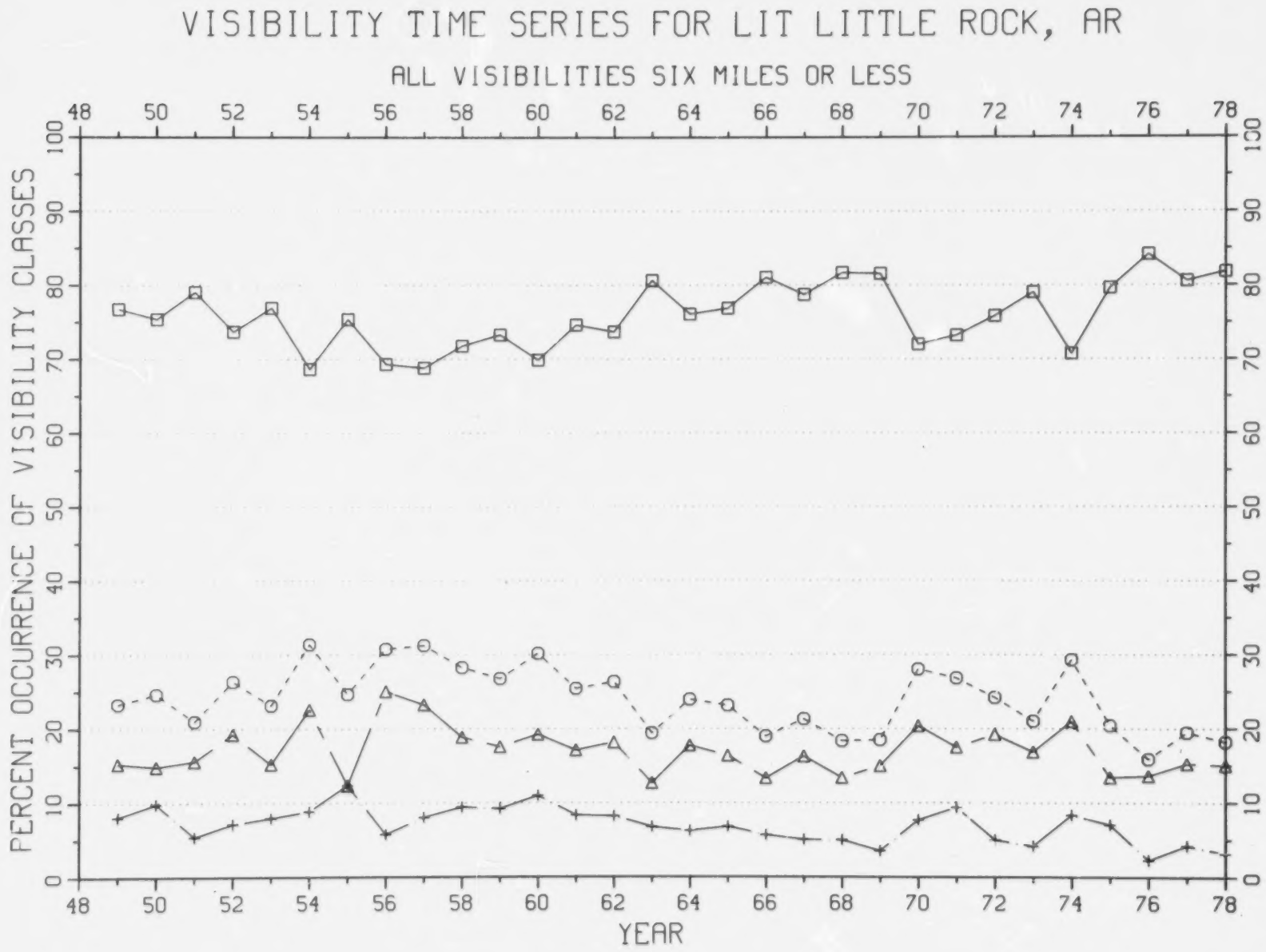
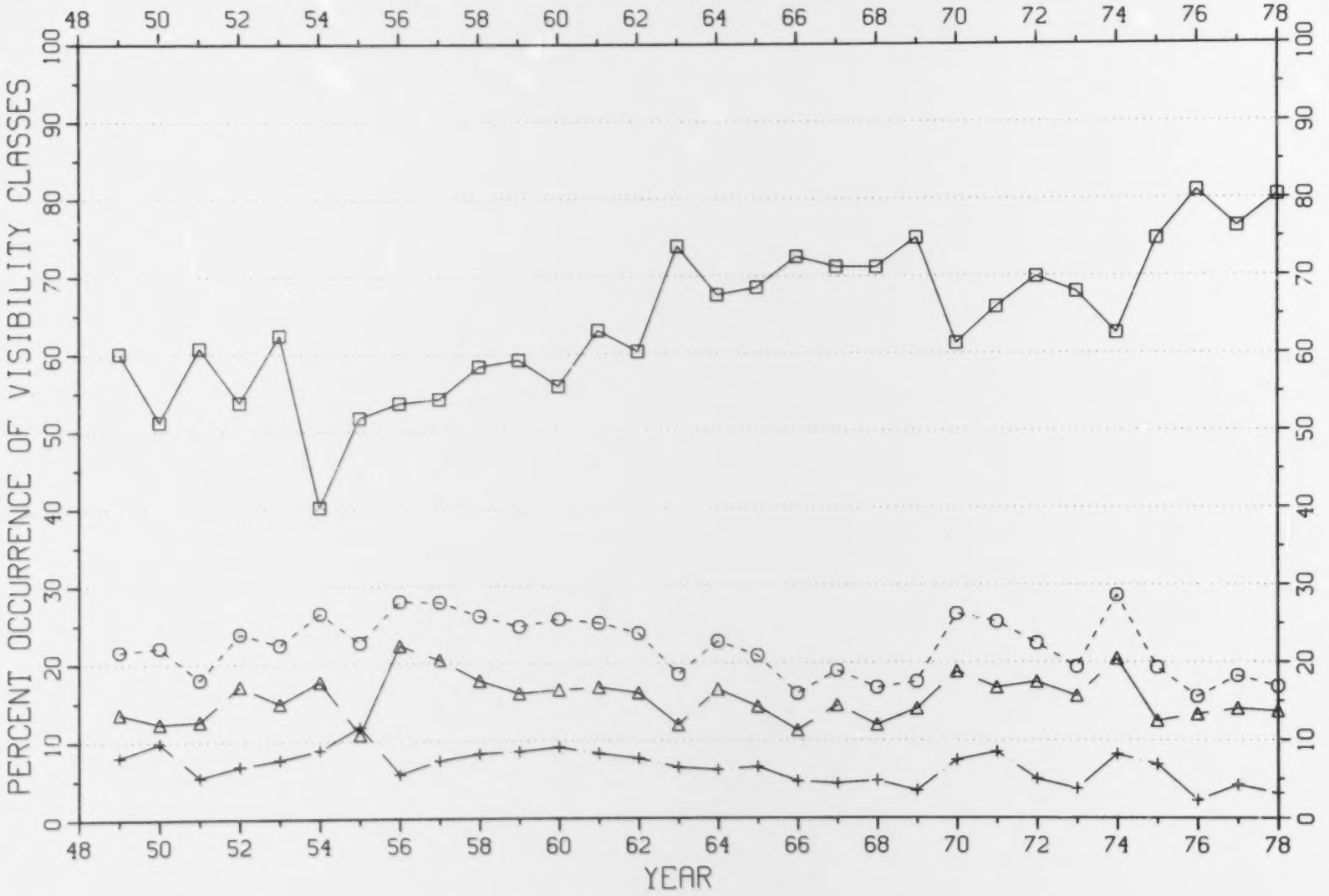

VISIBILITY TIME SERIES FOR LIT LITTLE ROCK, AR
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
0
10
20
30
40
50
60
70
80
90
100

VISIBILITY TIME SERIES FOR LIT LITTLE ROCK, AR

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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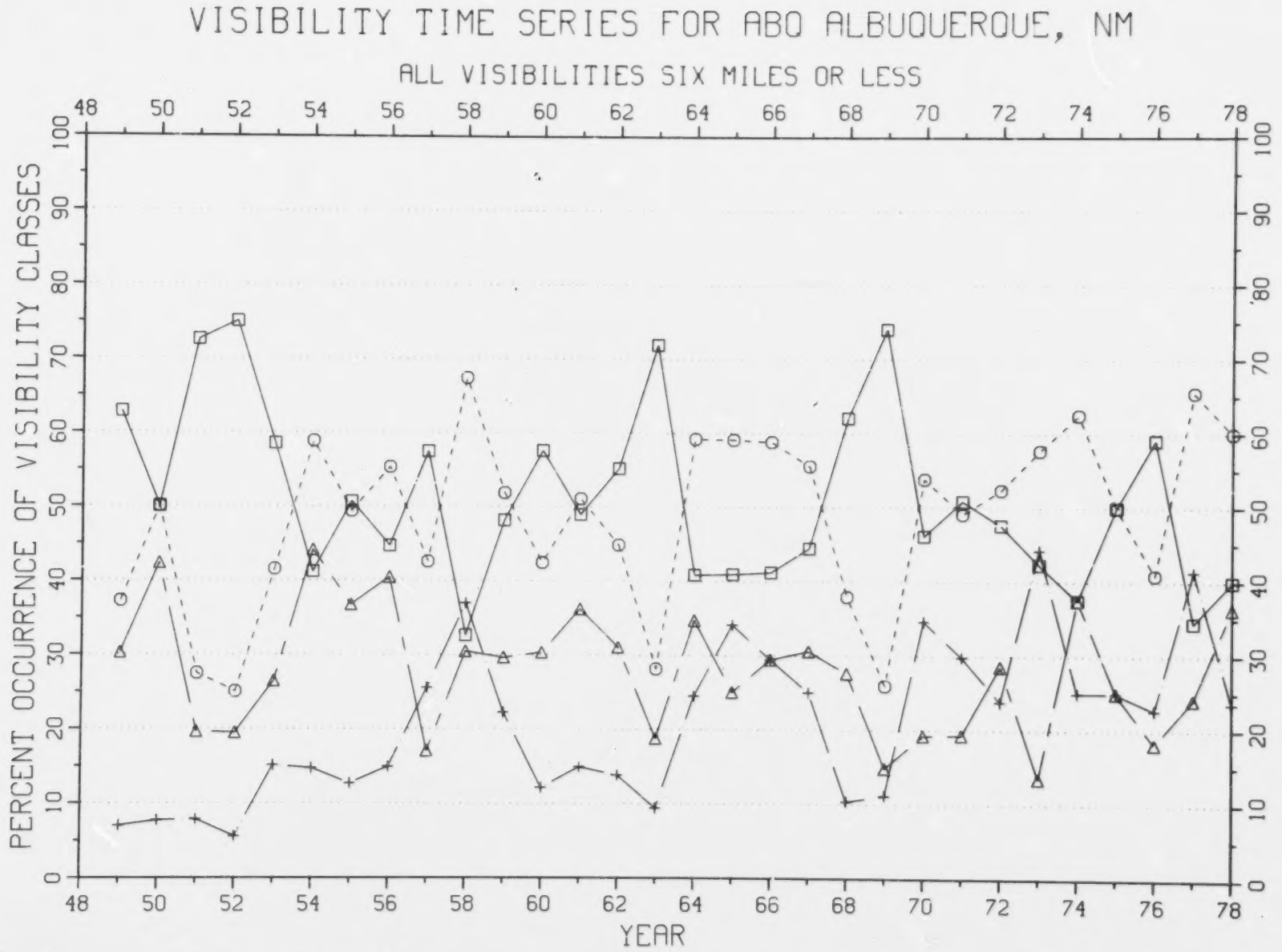

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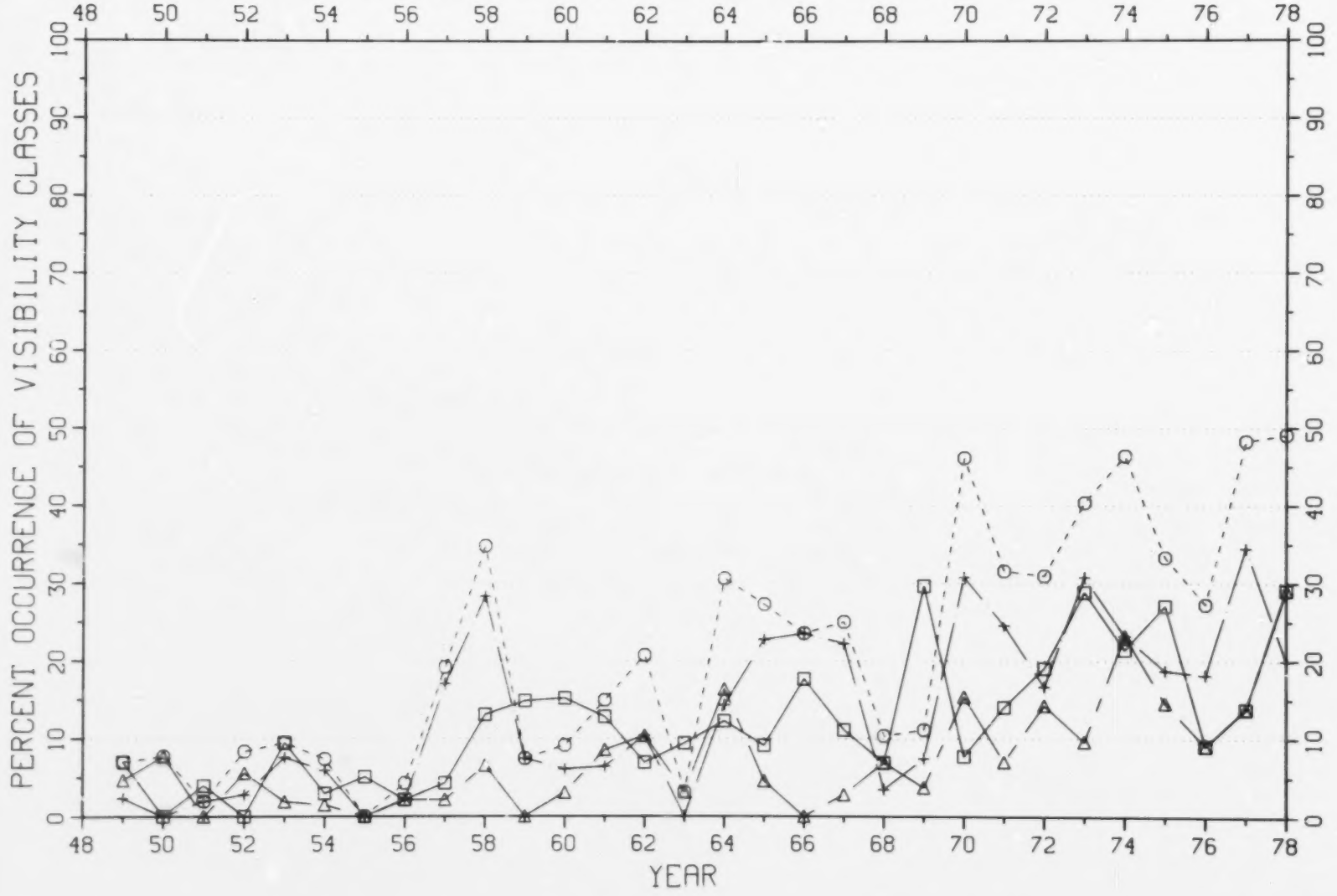
VISIBILITY TIME SERIES FOR ABQ ALBUQUERQUE, NM

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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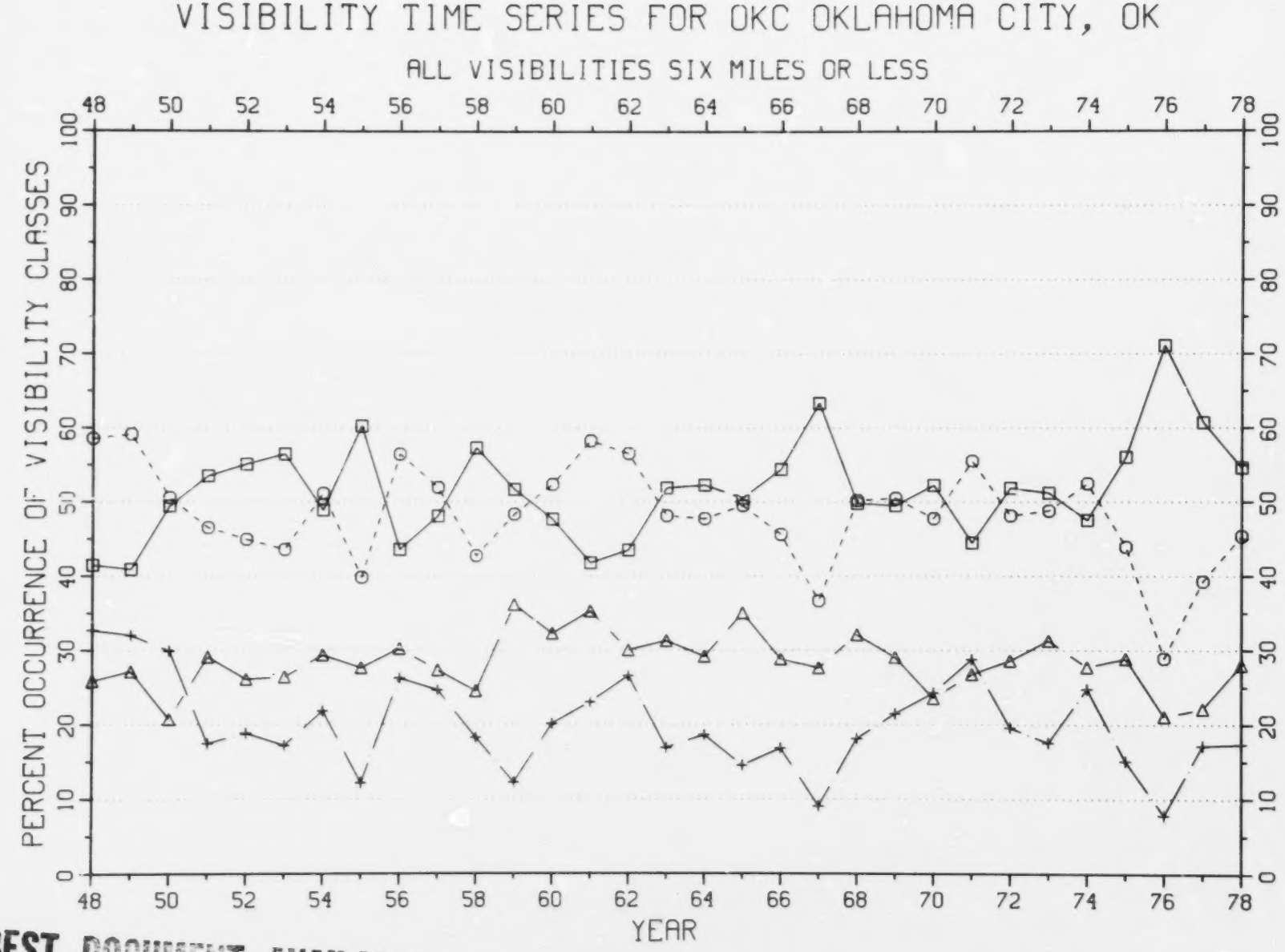

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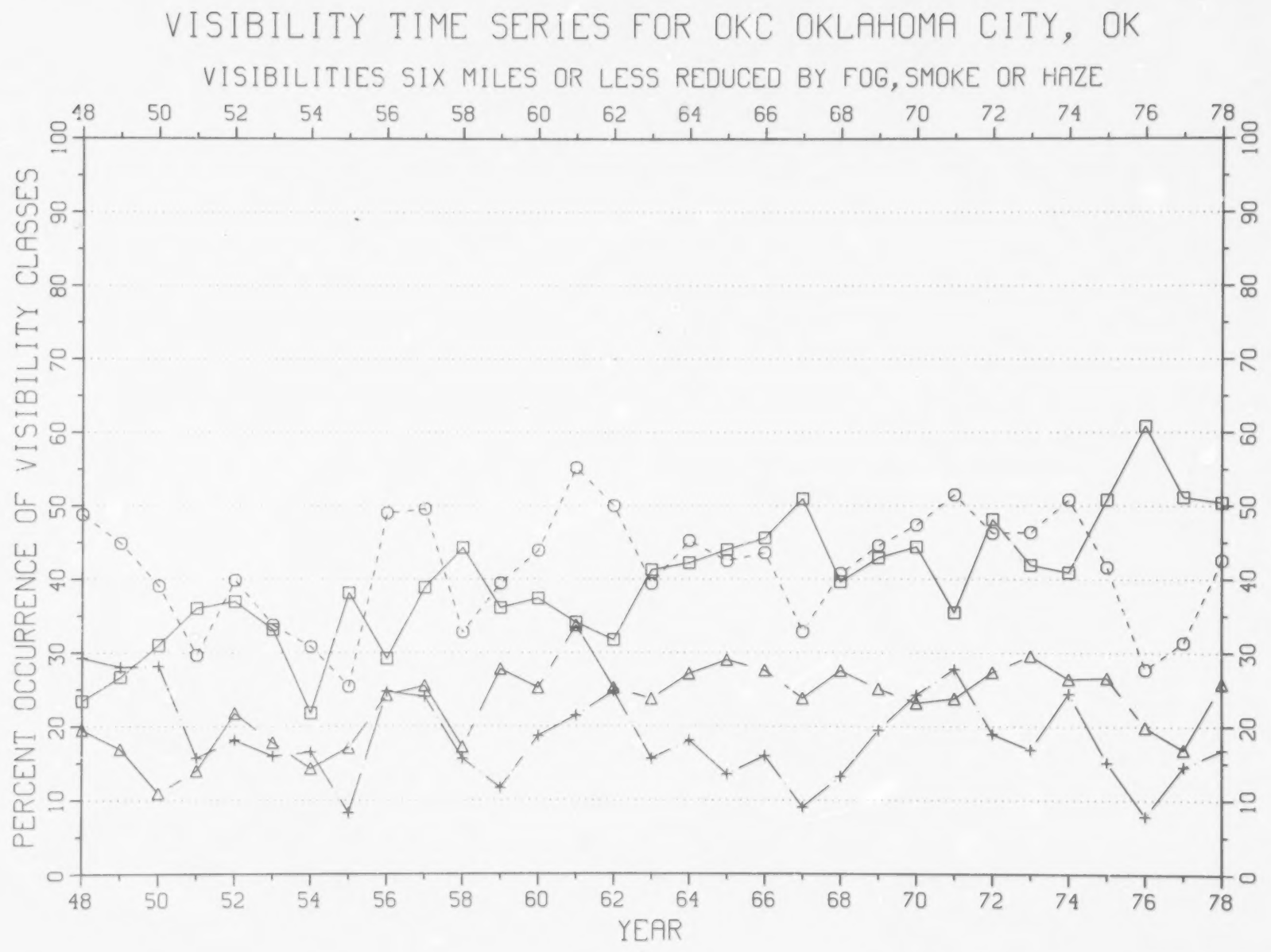
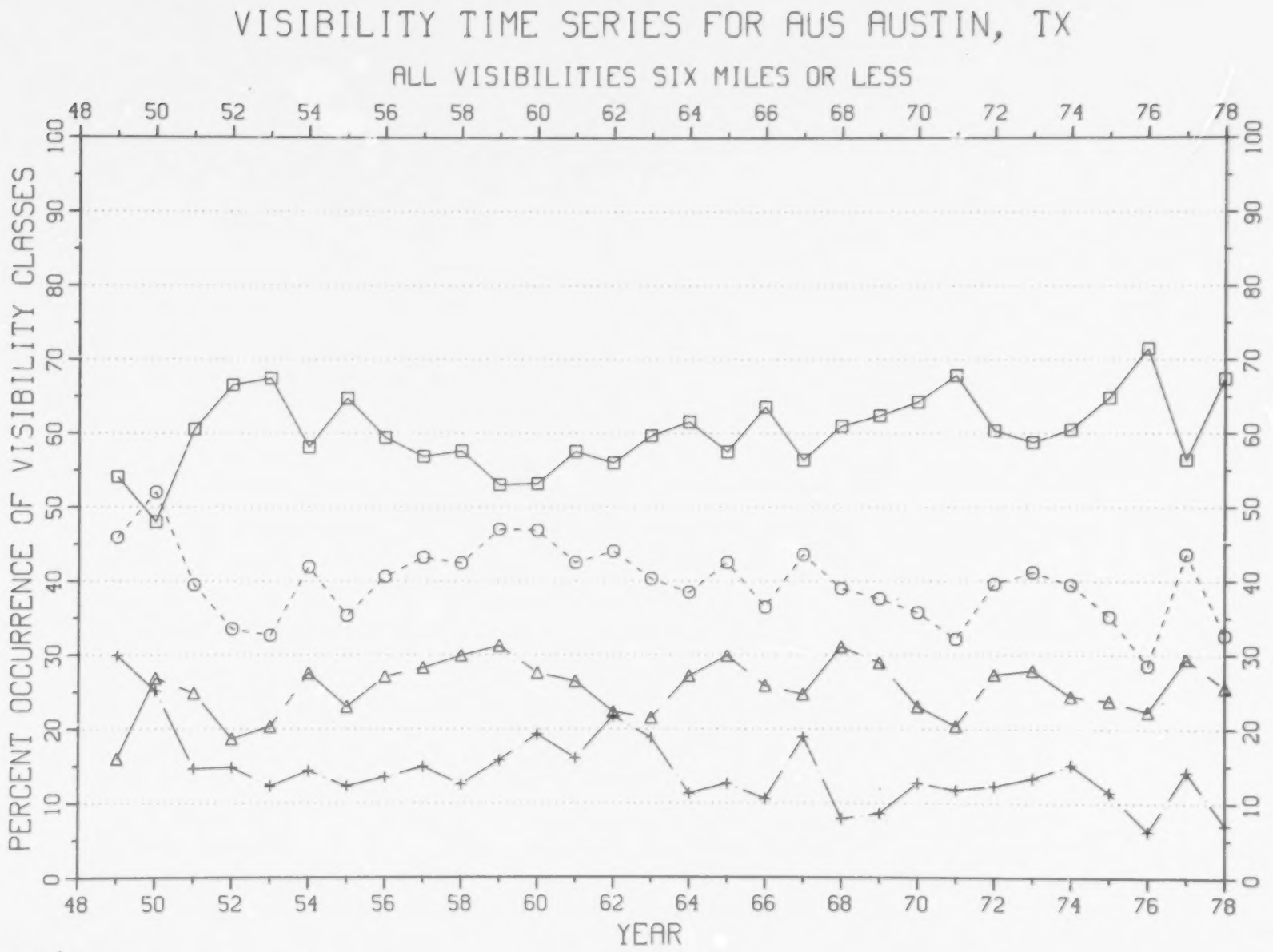

VISIBILITY TIME SERIES FOR OKC OKLAHOMA CITY, OK
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

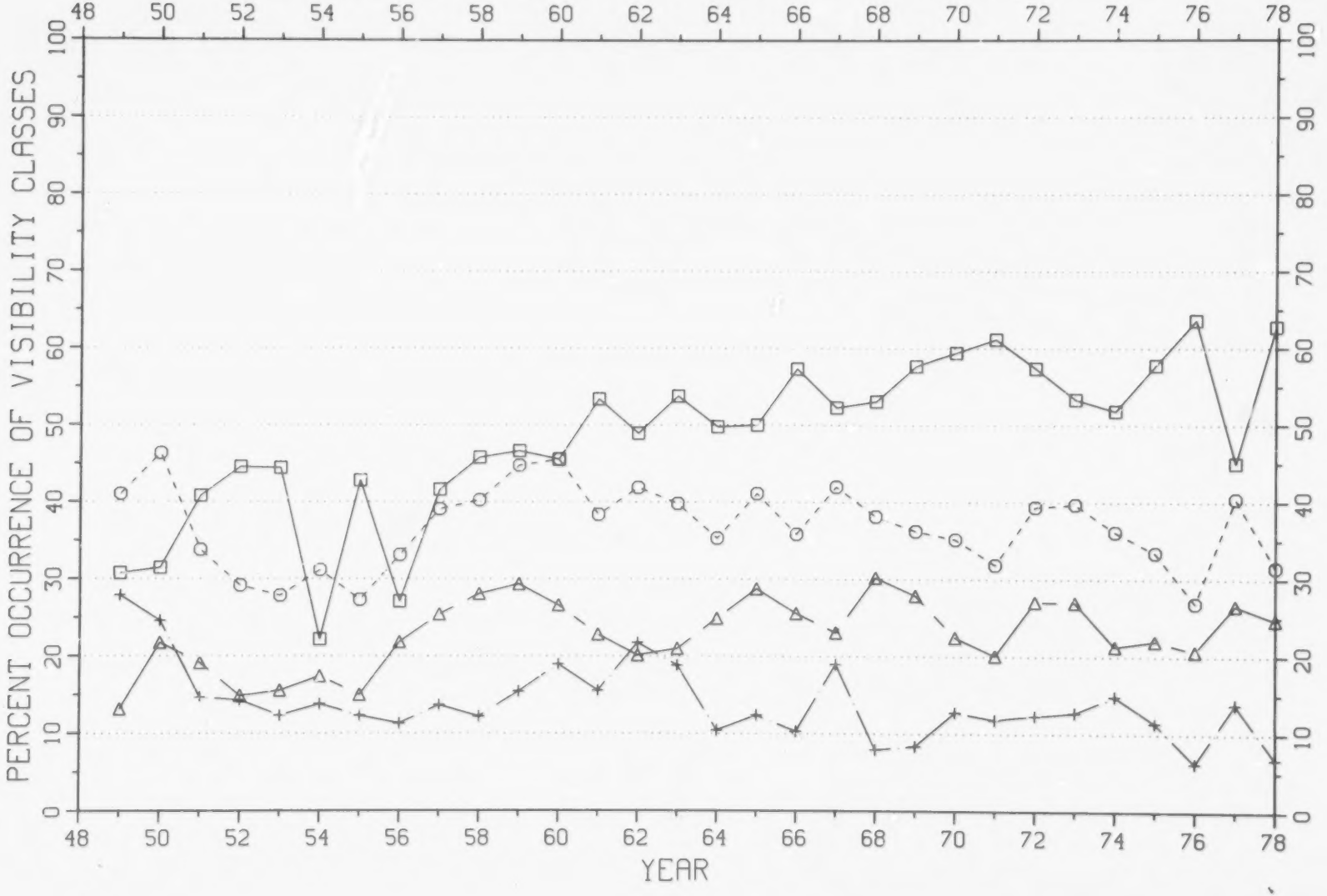
BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR AUS AUSTIN, TX
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR AUS AUSTIN, TX

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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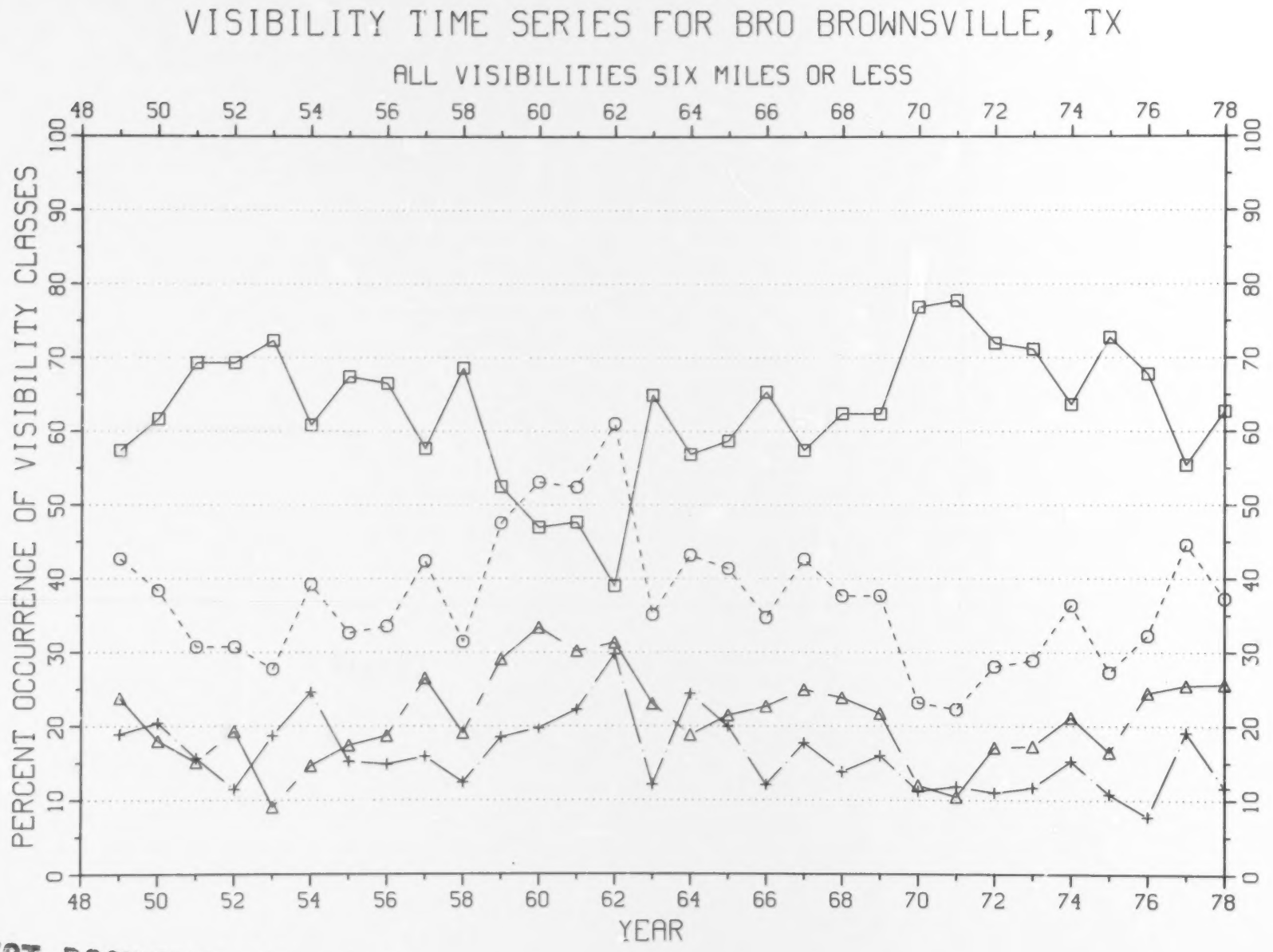

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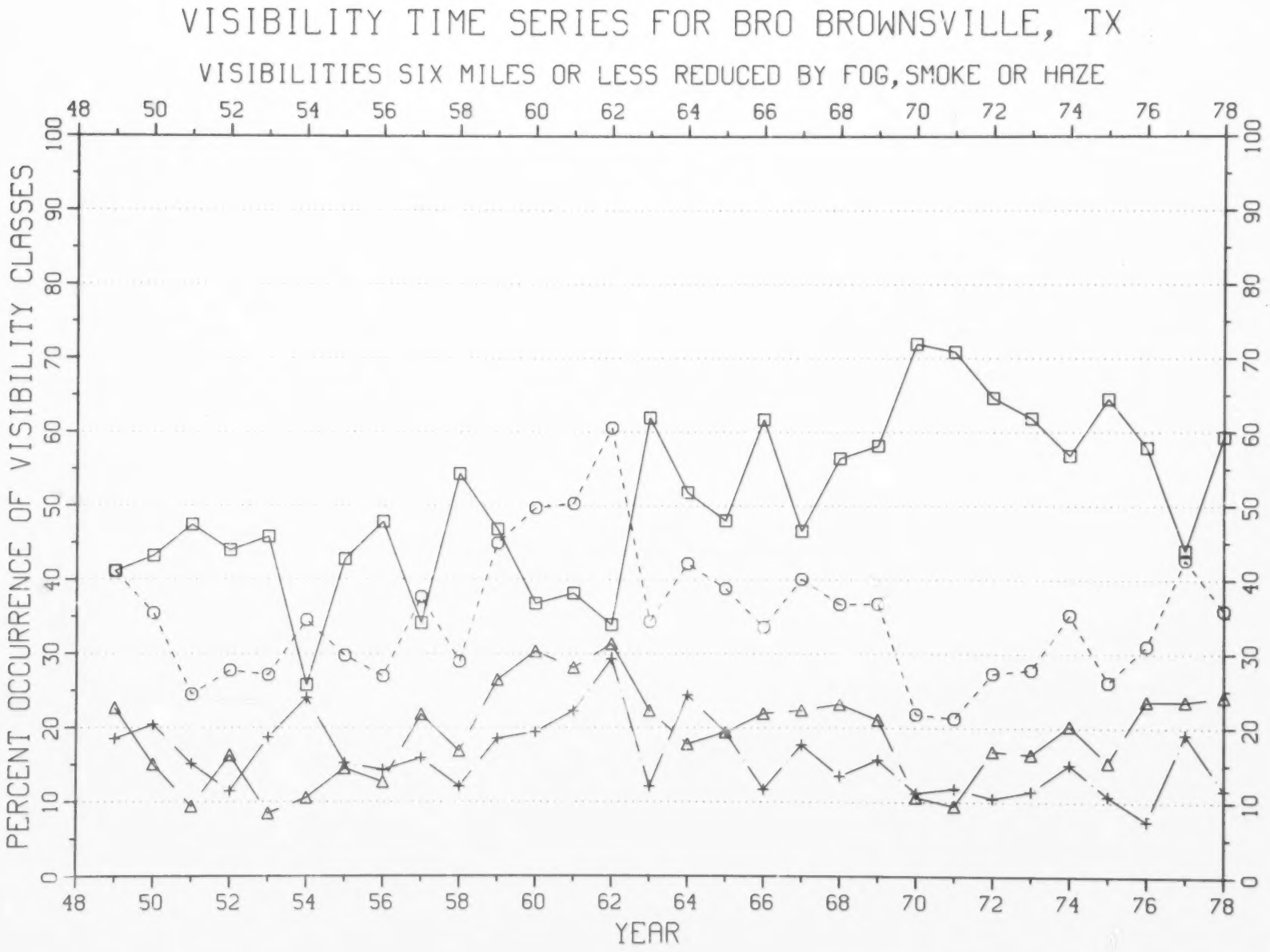
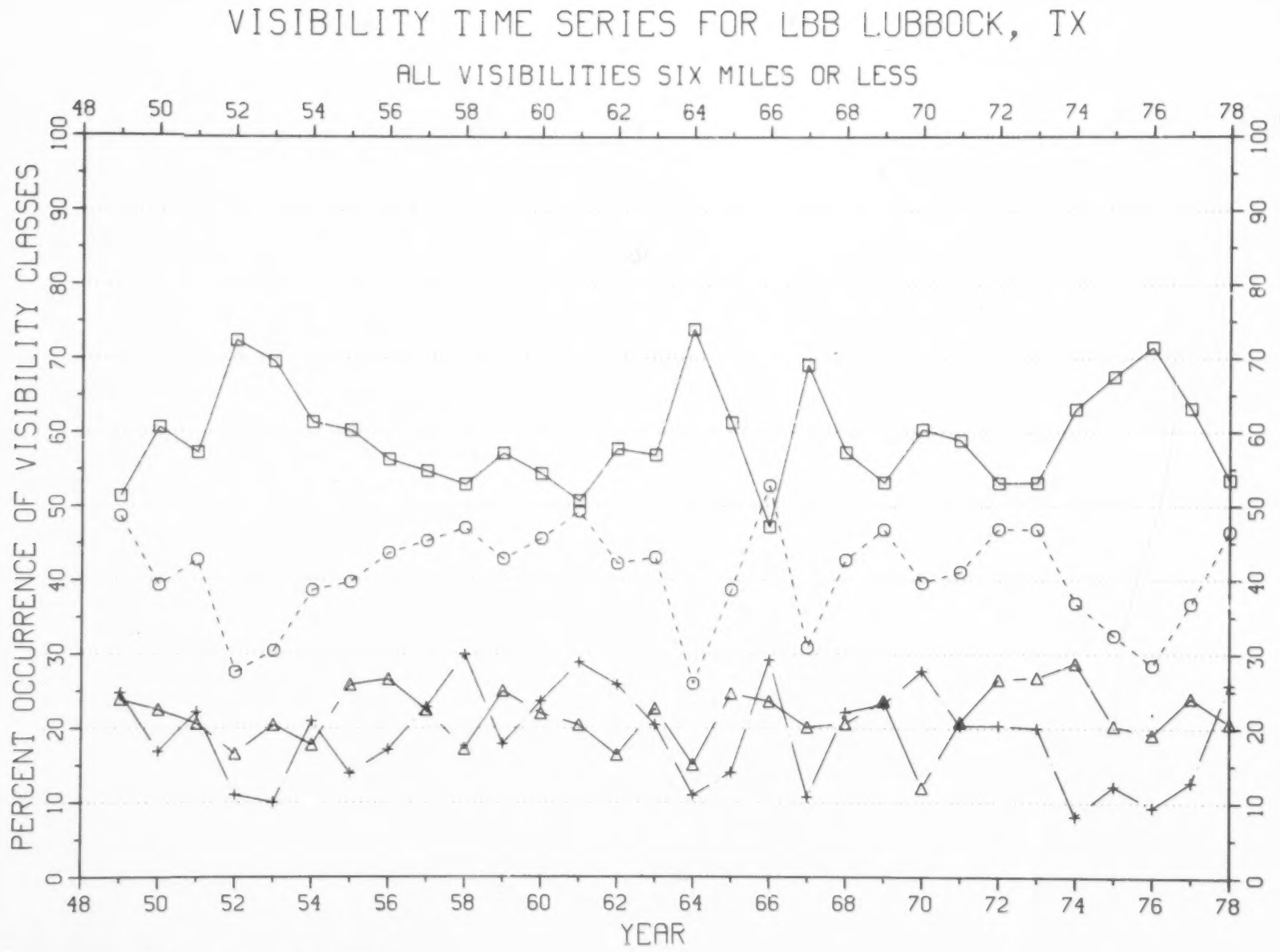

VISIBILITY TIME SERIES FOR BRO BROWNSVILLE, TX
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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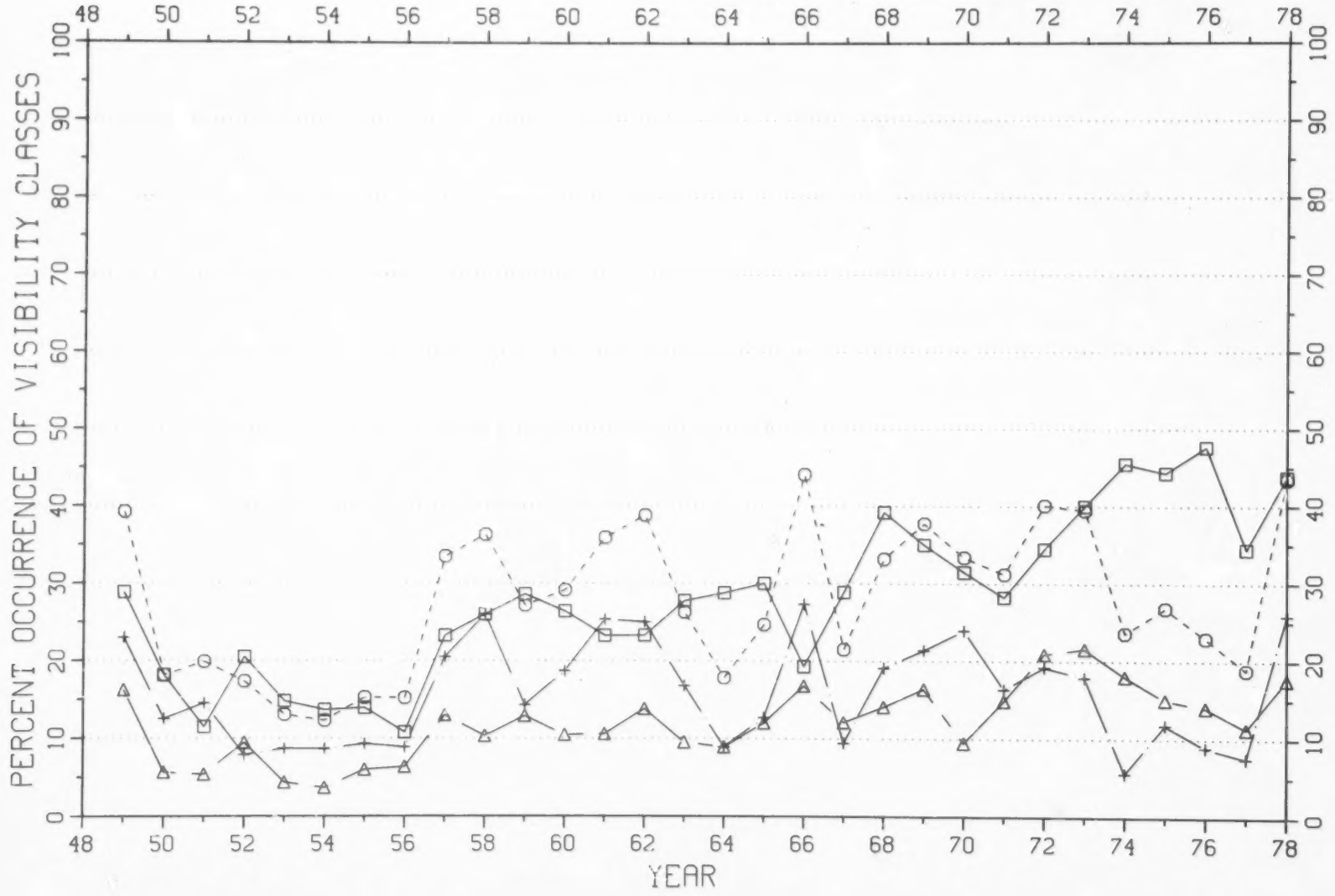
VISIBILITY TIME SERIES FOR LBB LUBBOCK, TX

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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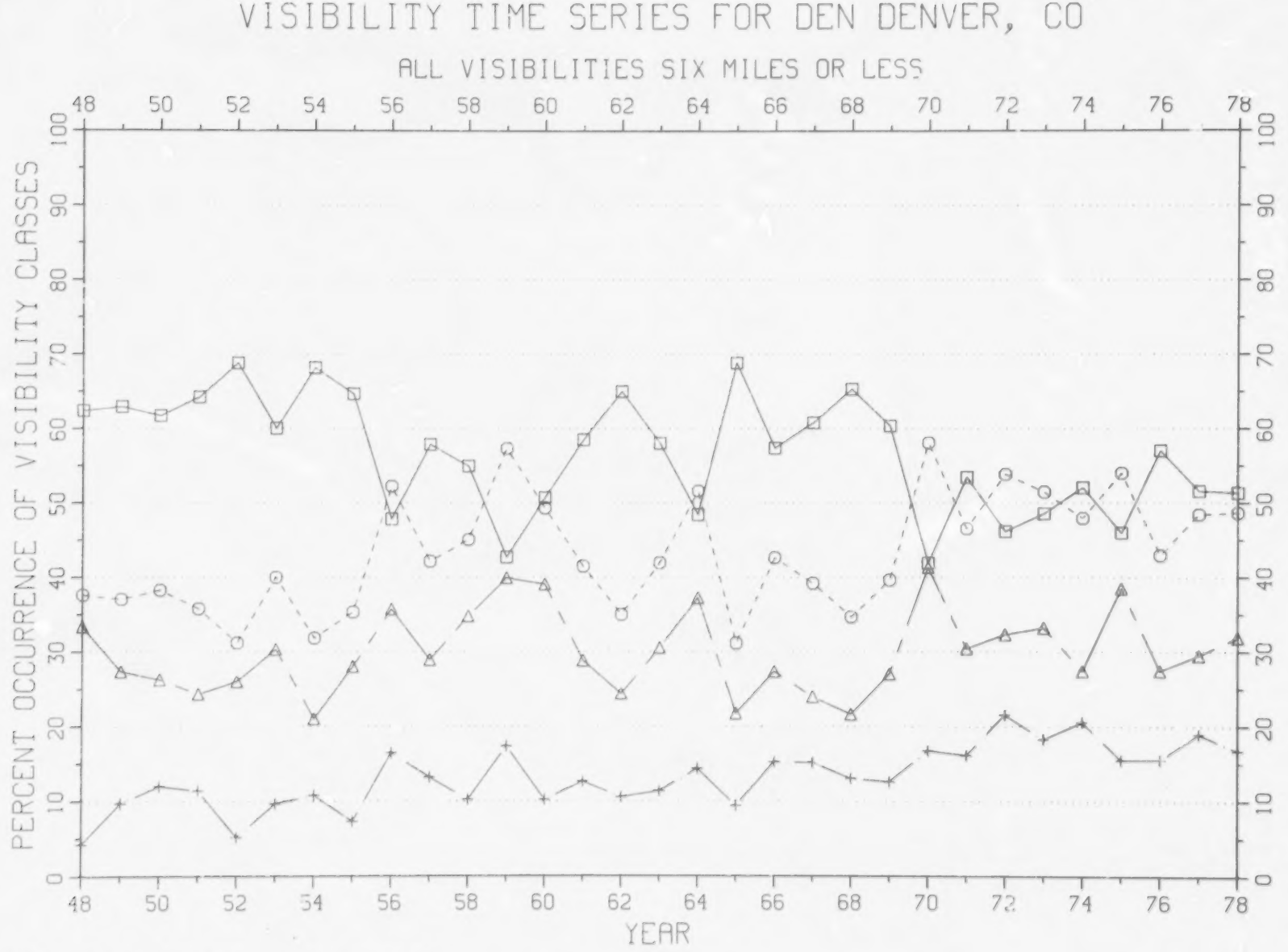

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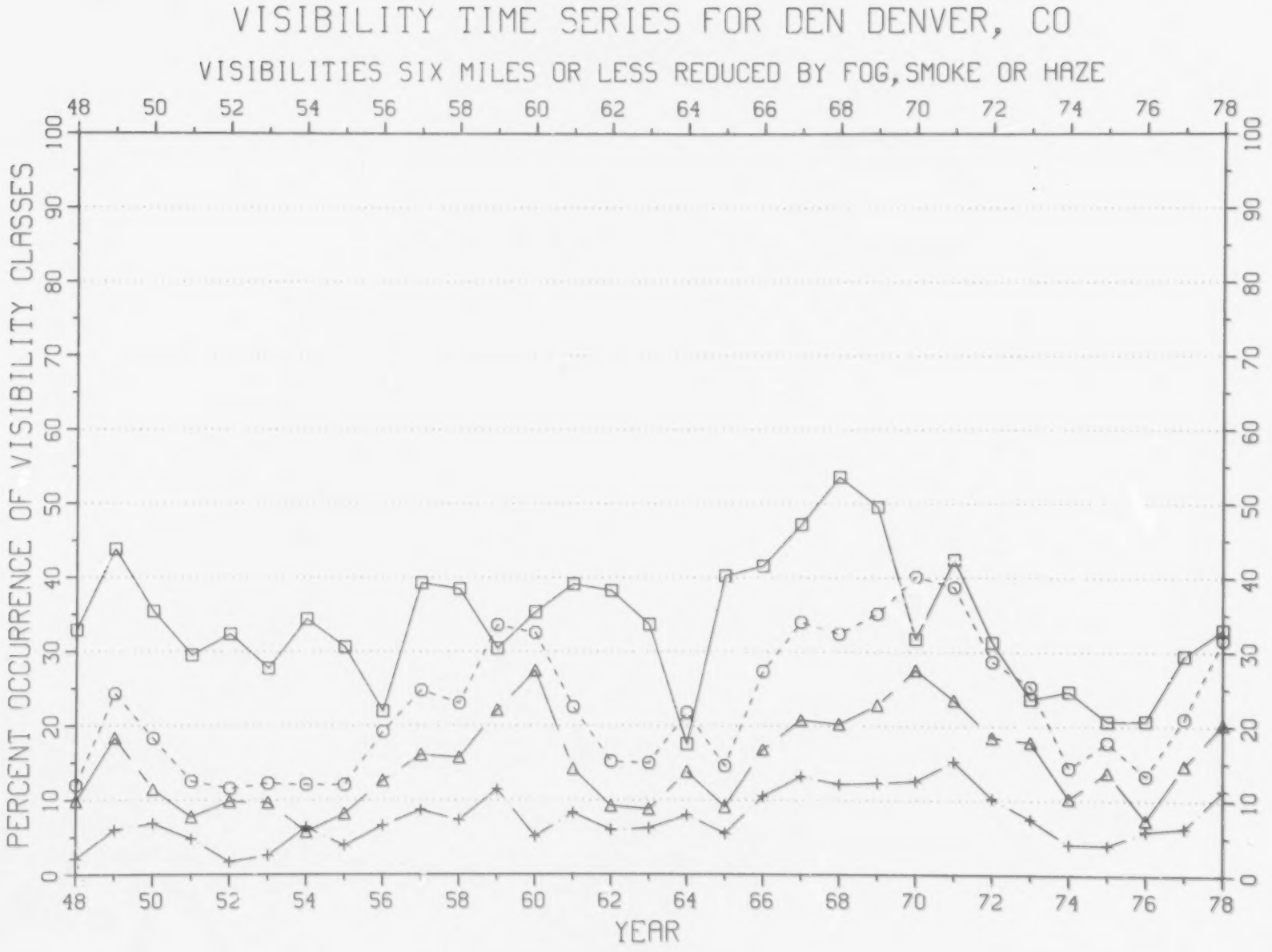
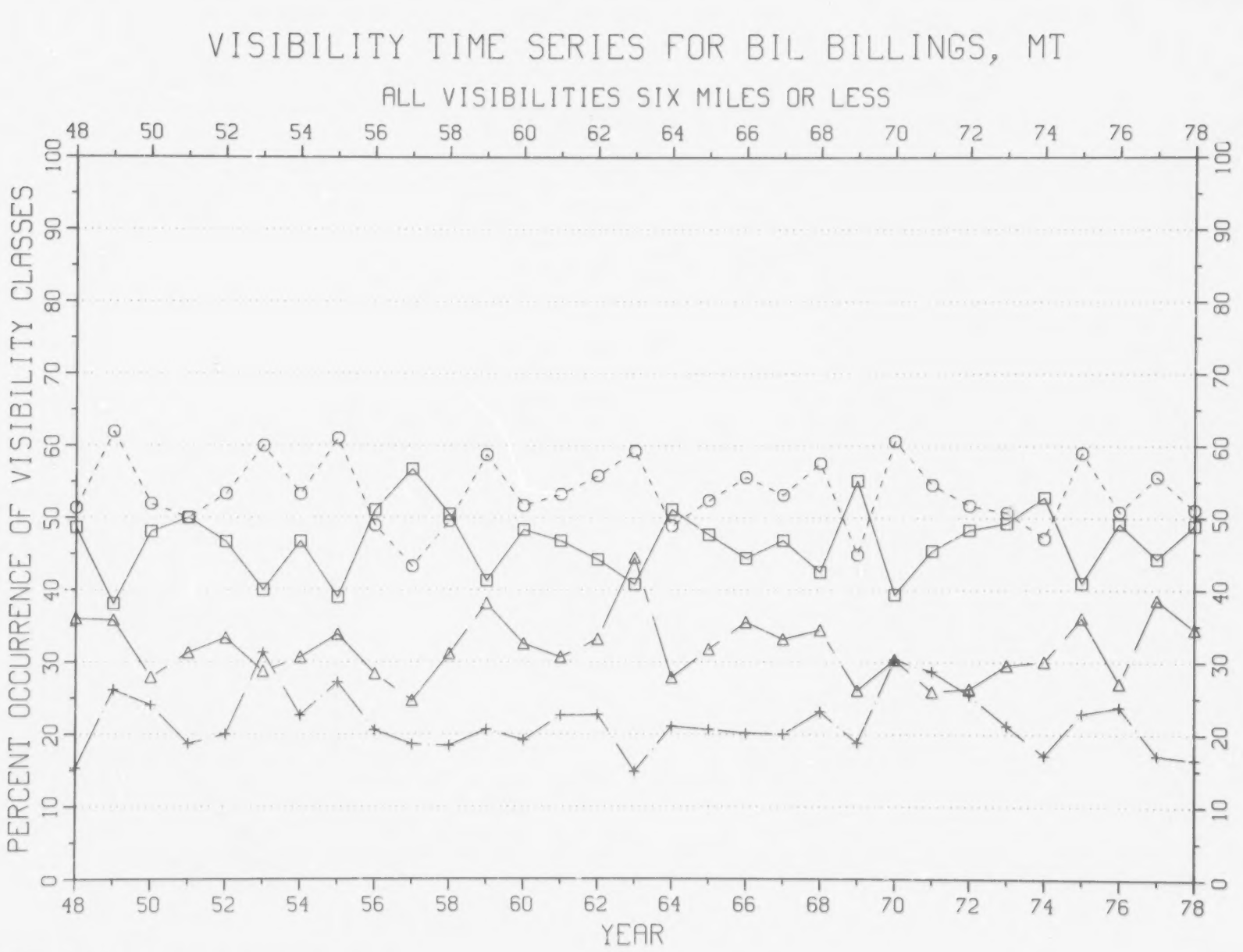

VISIBILITY TIME SERIES FOR DEN DENVER, CO
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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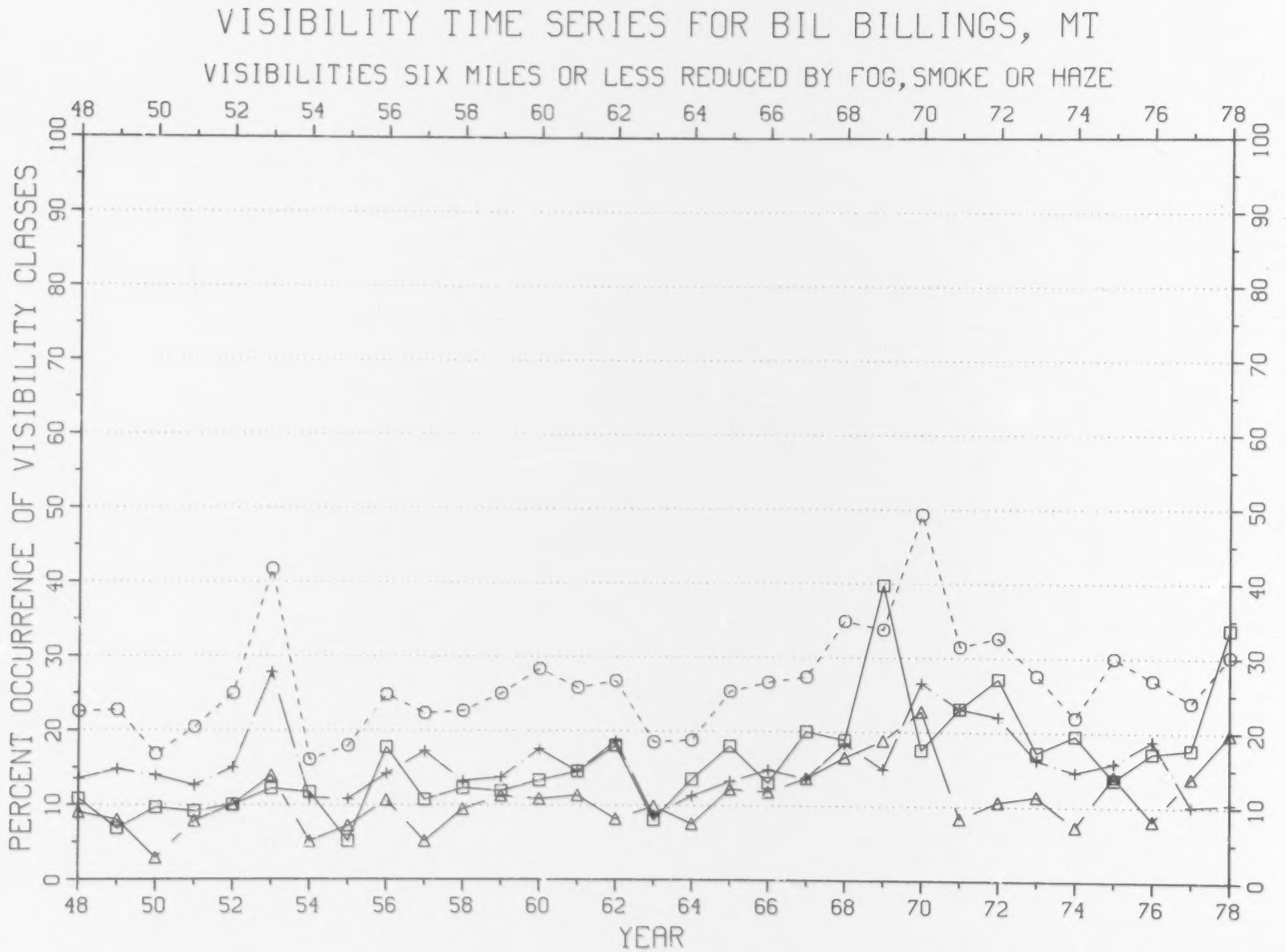
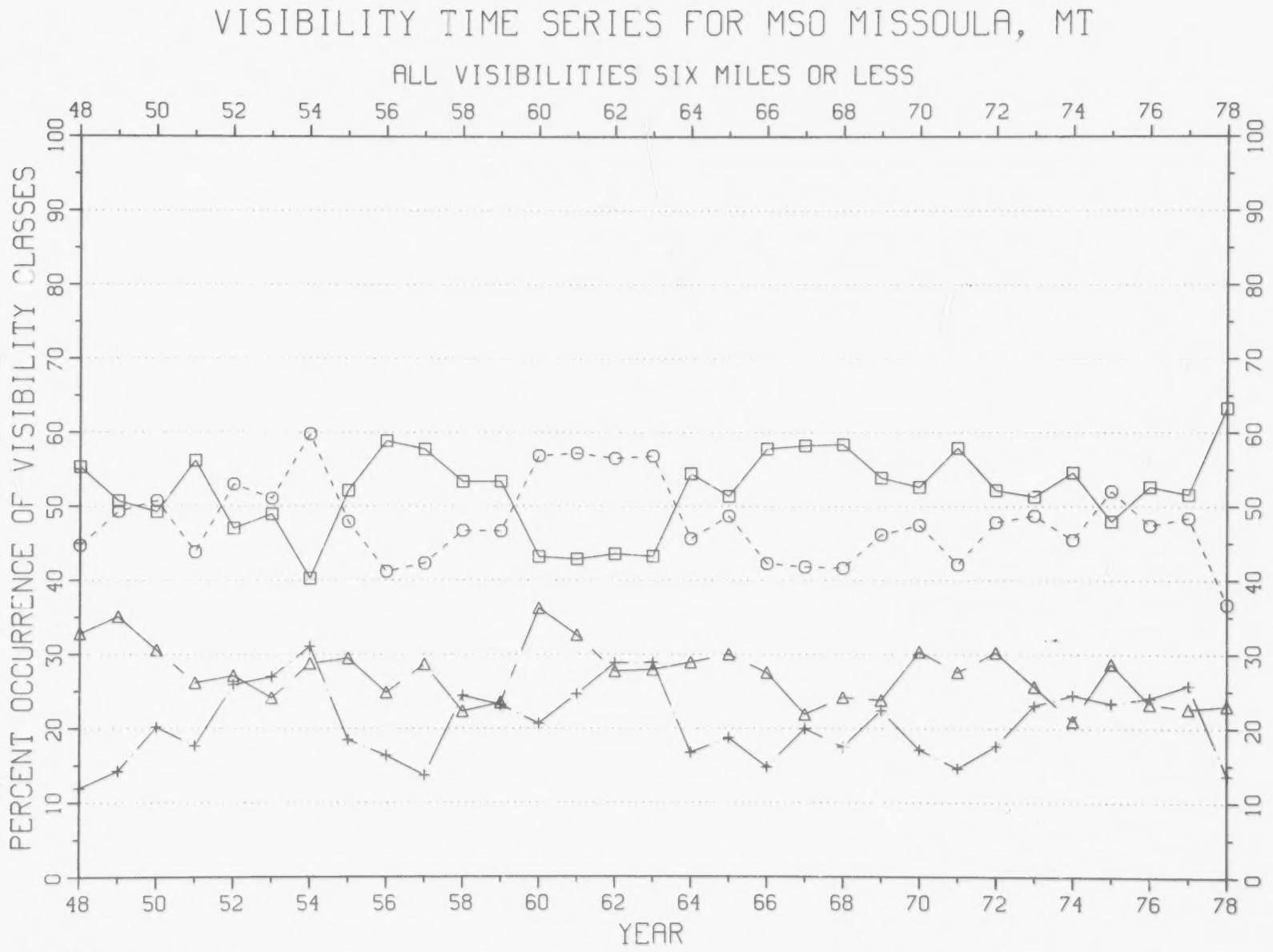

VISIBILITY TIME SERIES FOR BIL BILLINGS, MT
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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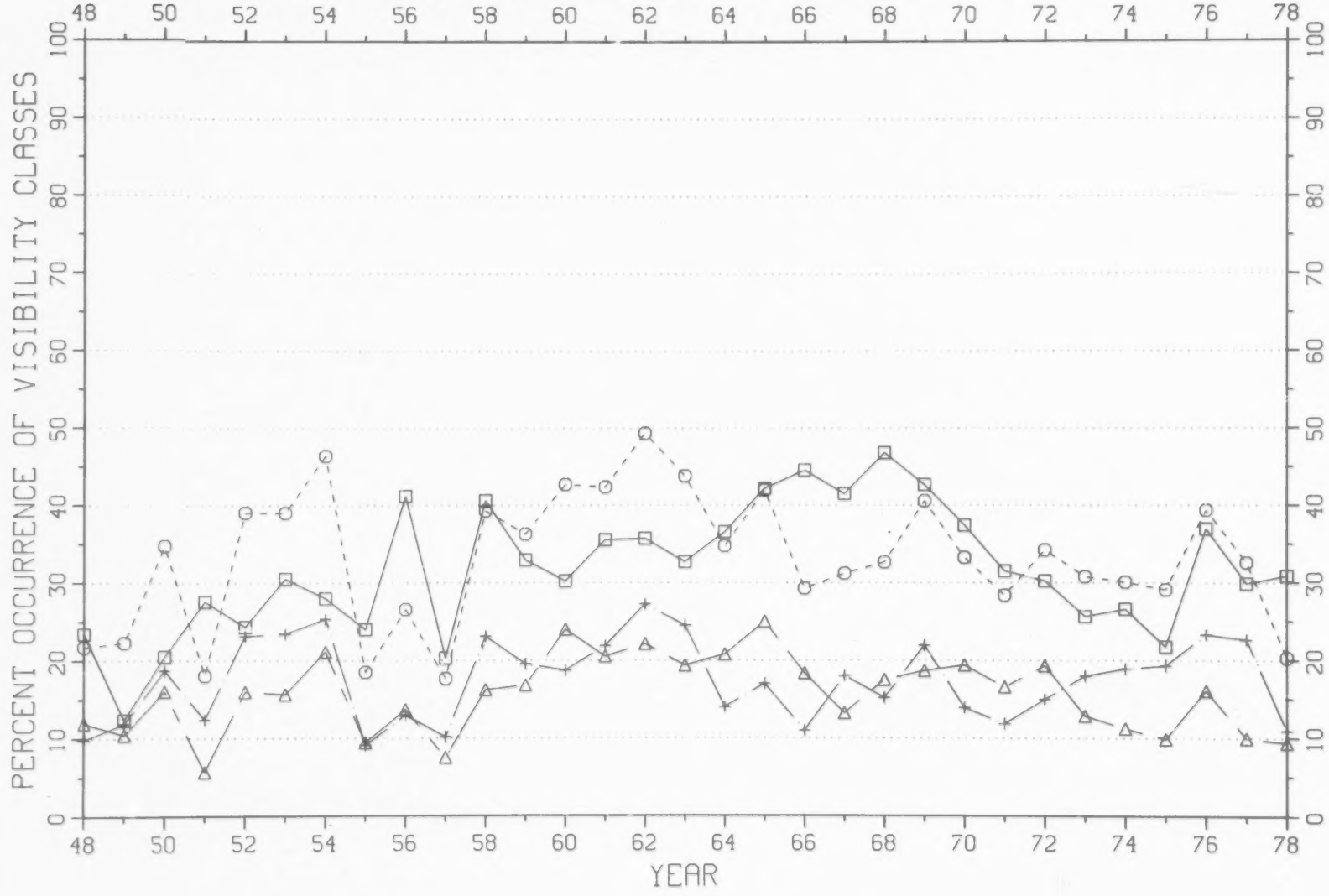
VISIBILITY TIME SERIES FOR MSO MISSOULA, MT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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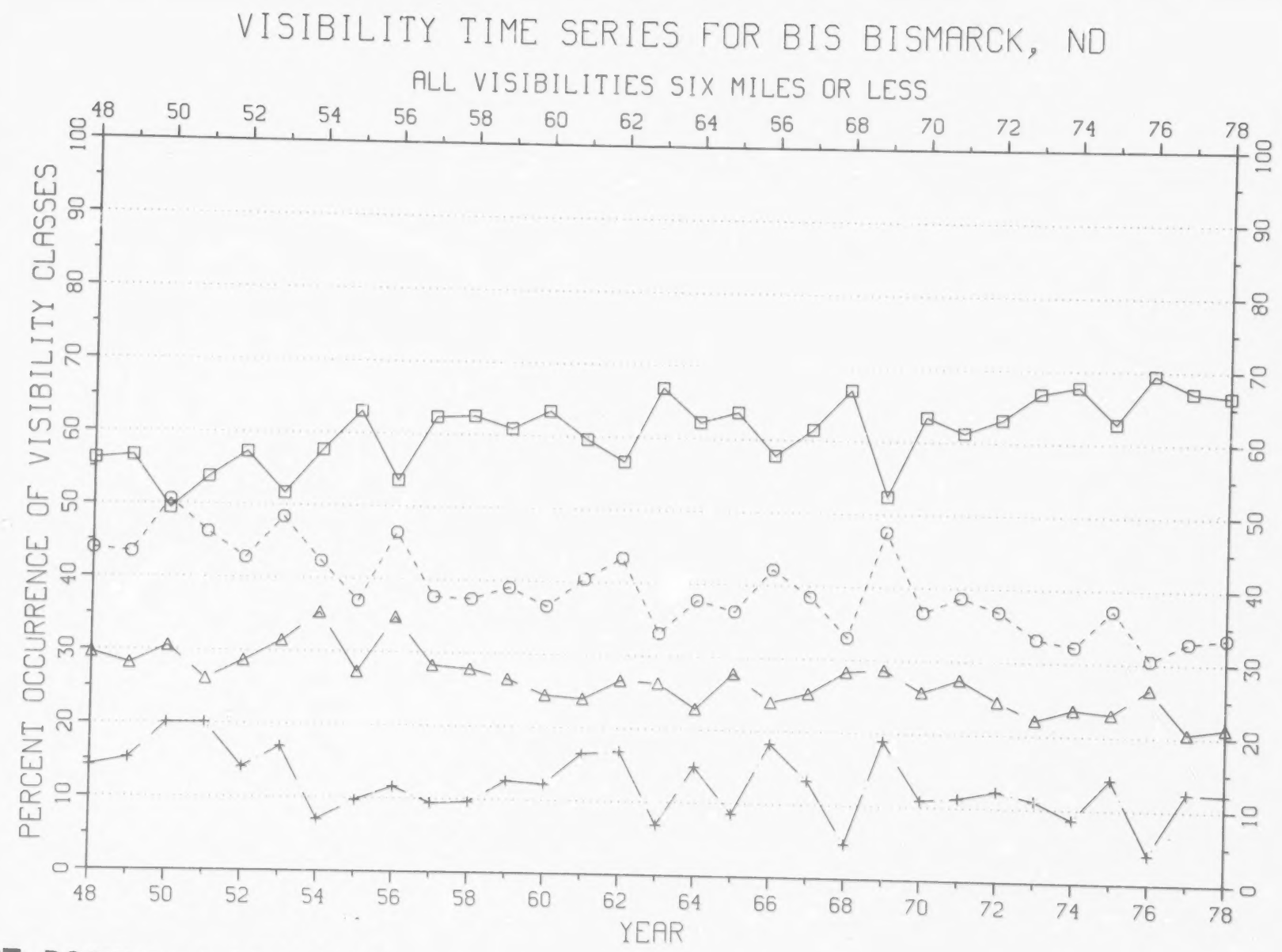
VISIBILITY TIME SERIES FOR BIS BISMARCK, ND
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

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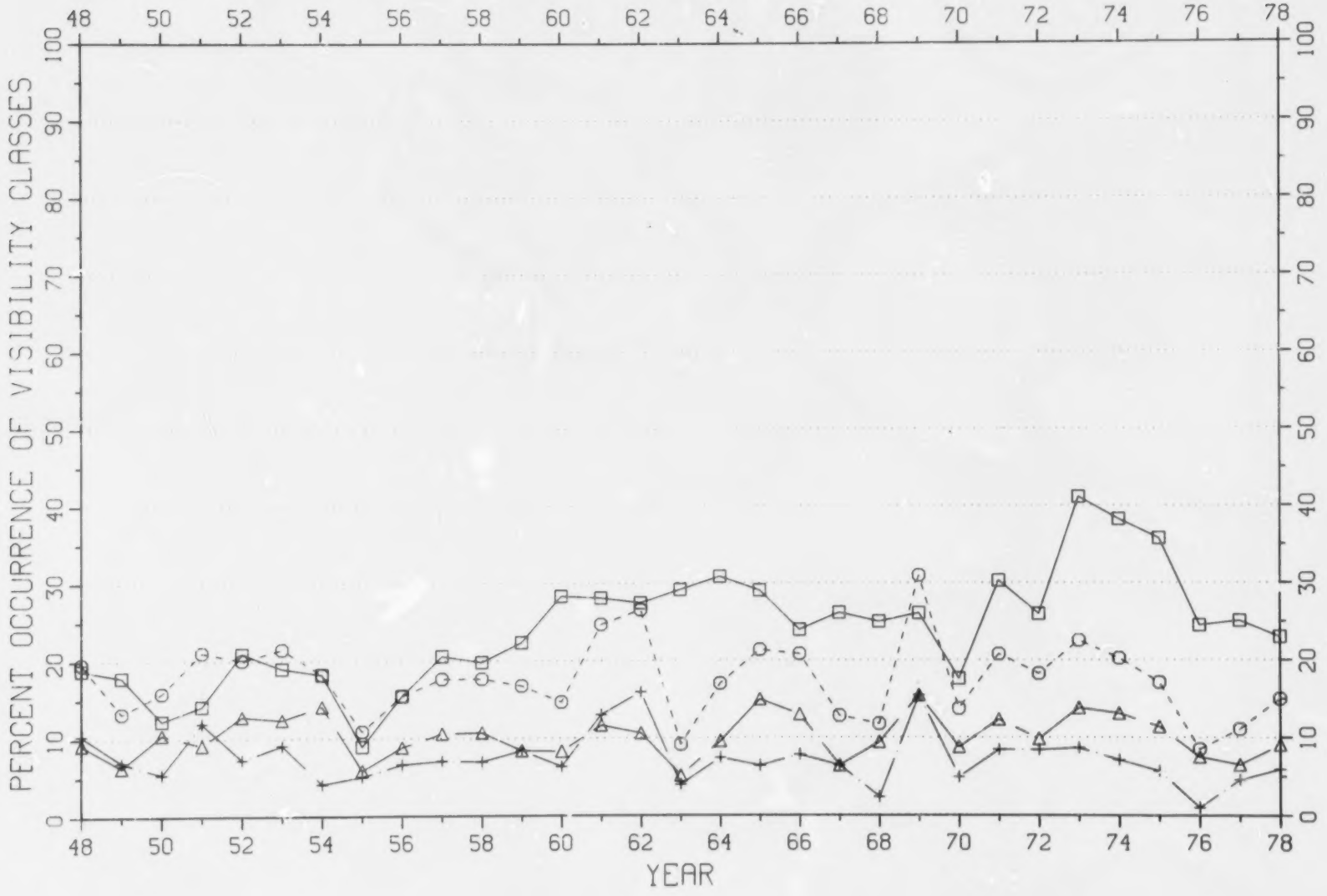
VISIBILITY TIME SERIES FOR BIS BISMARCK, ND

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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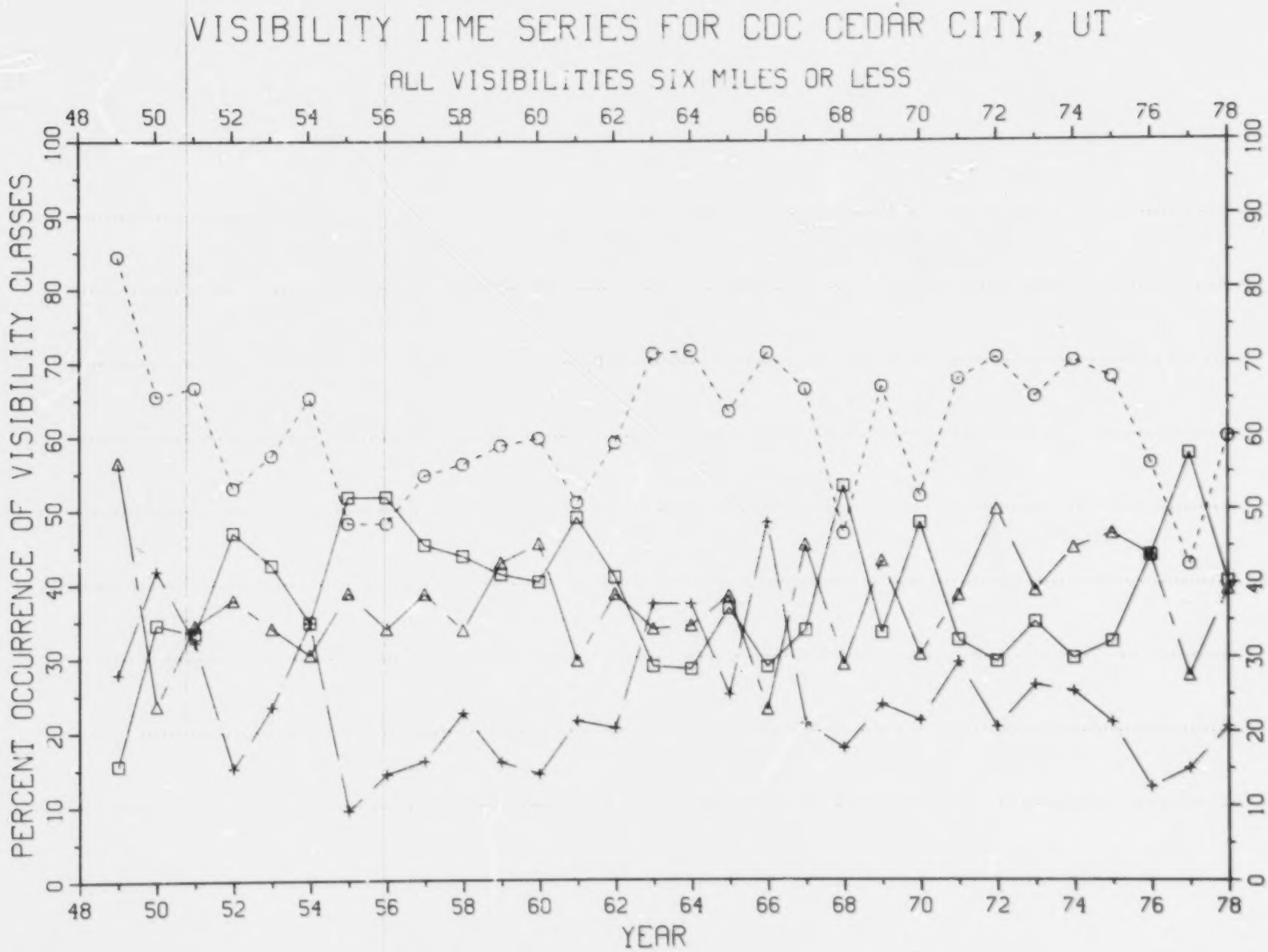

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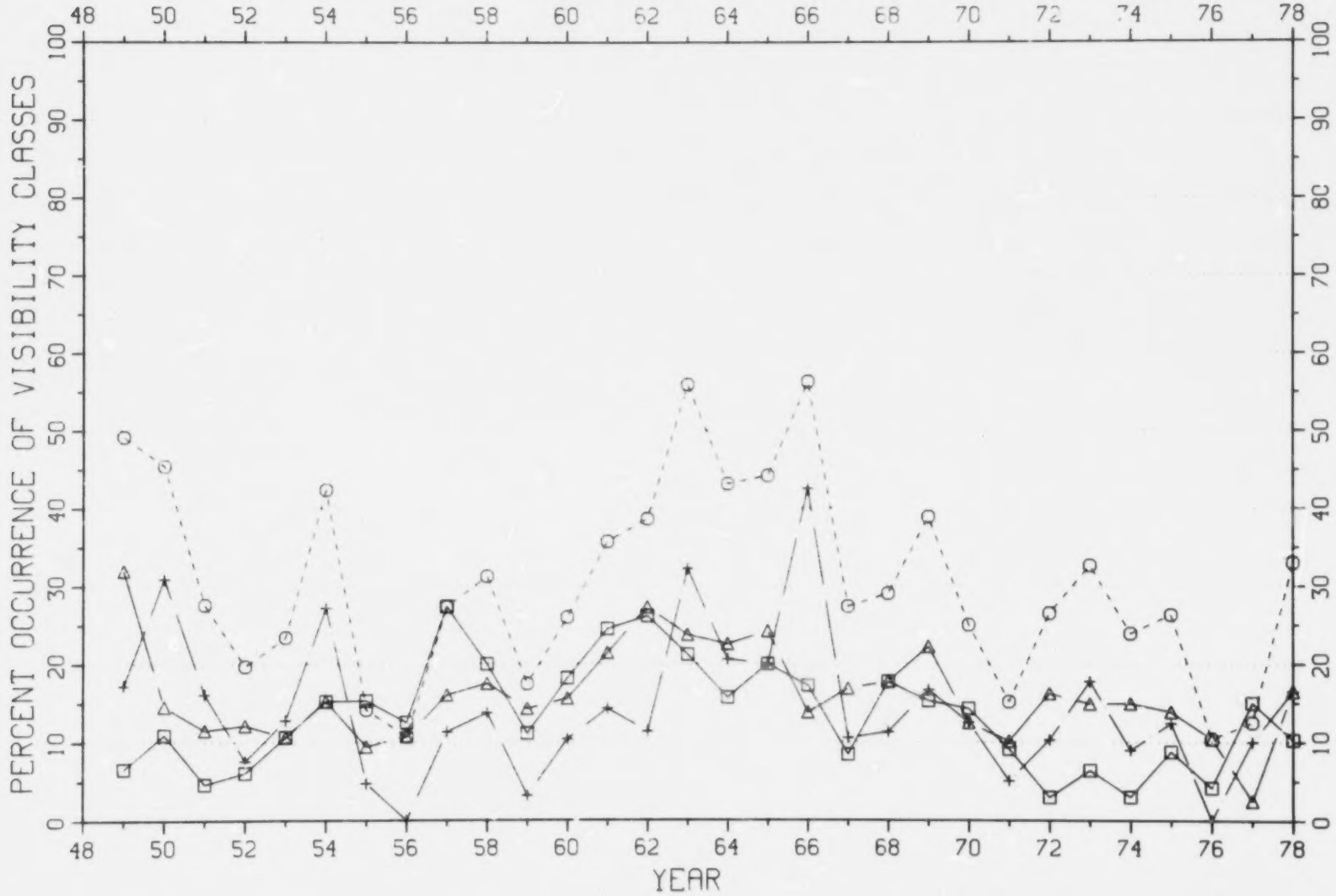
VISIBILITY TIME SERIES FOR CDC CEDAR CITY, UT
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

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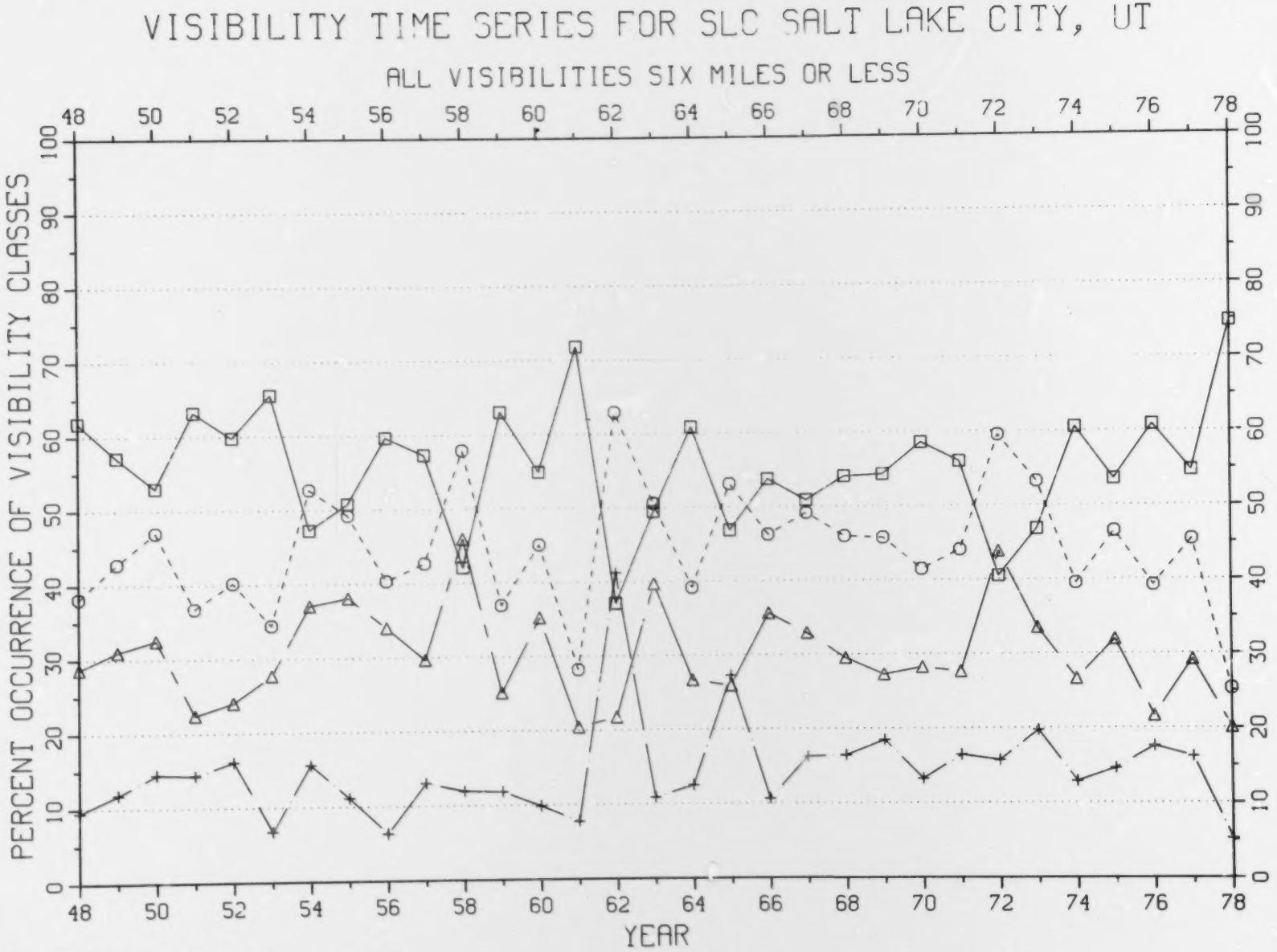

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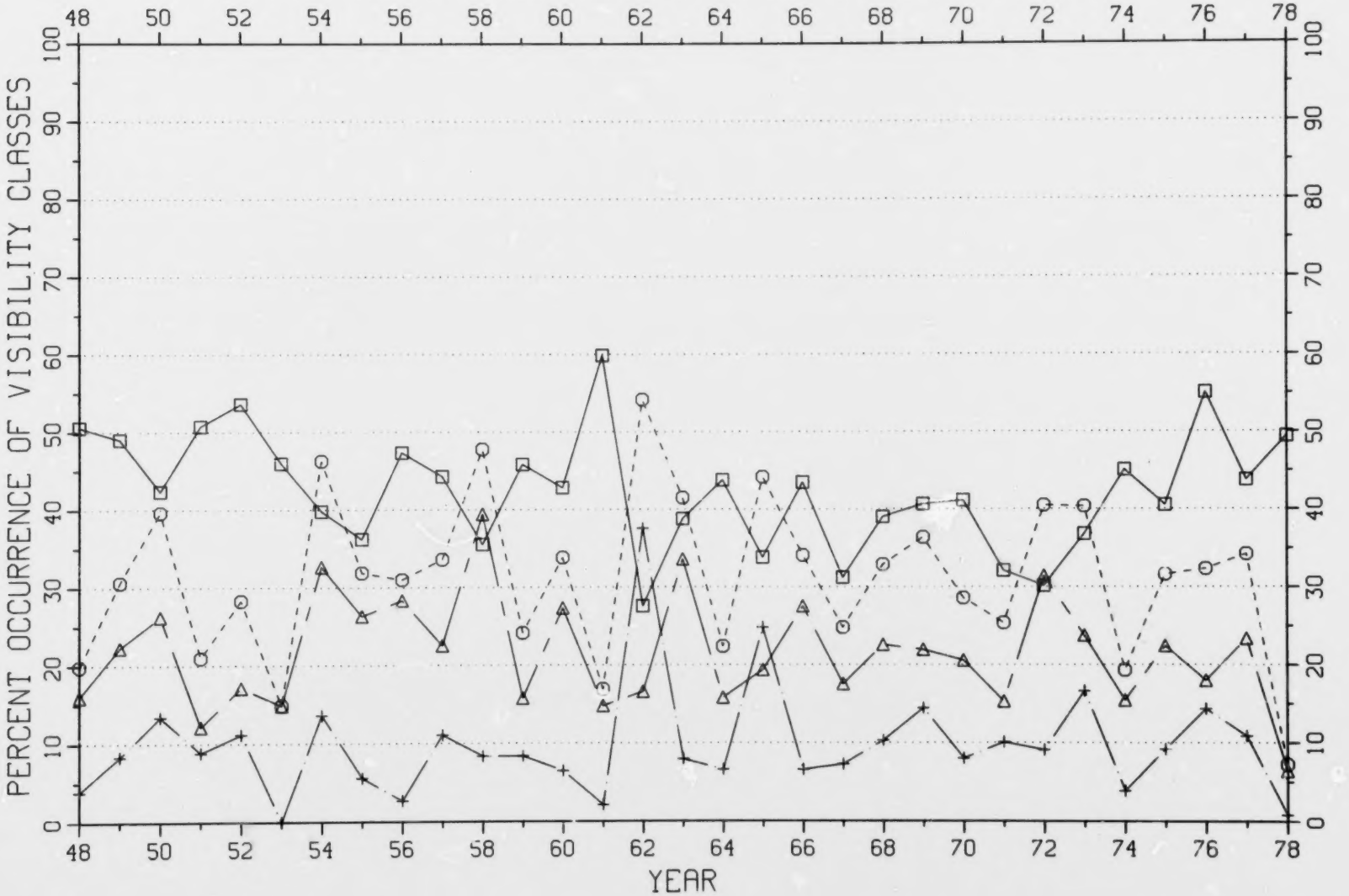
VISIBILITY TIME SERIES FOR SLC SALT LAKE CITY, UT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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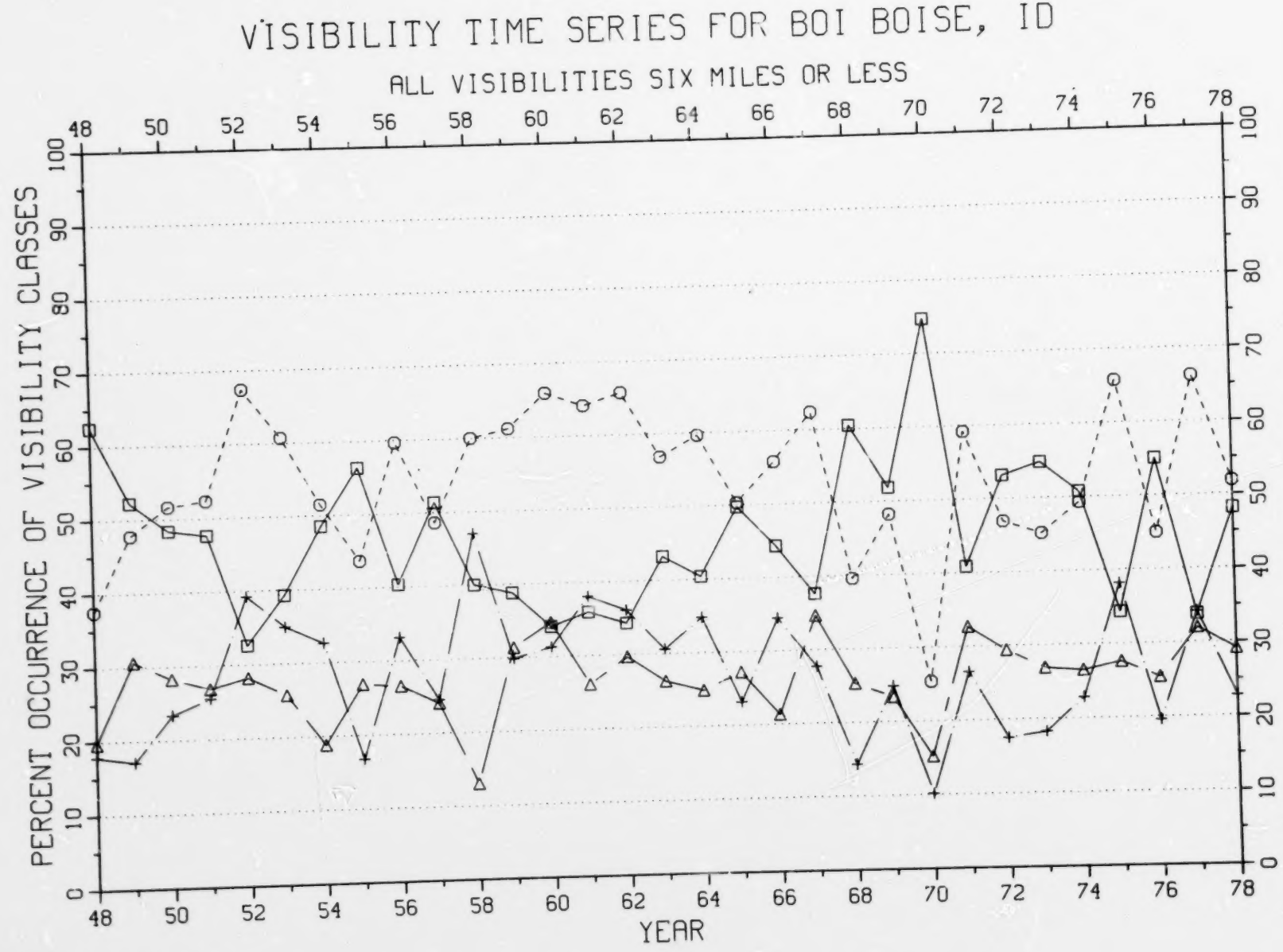

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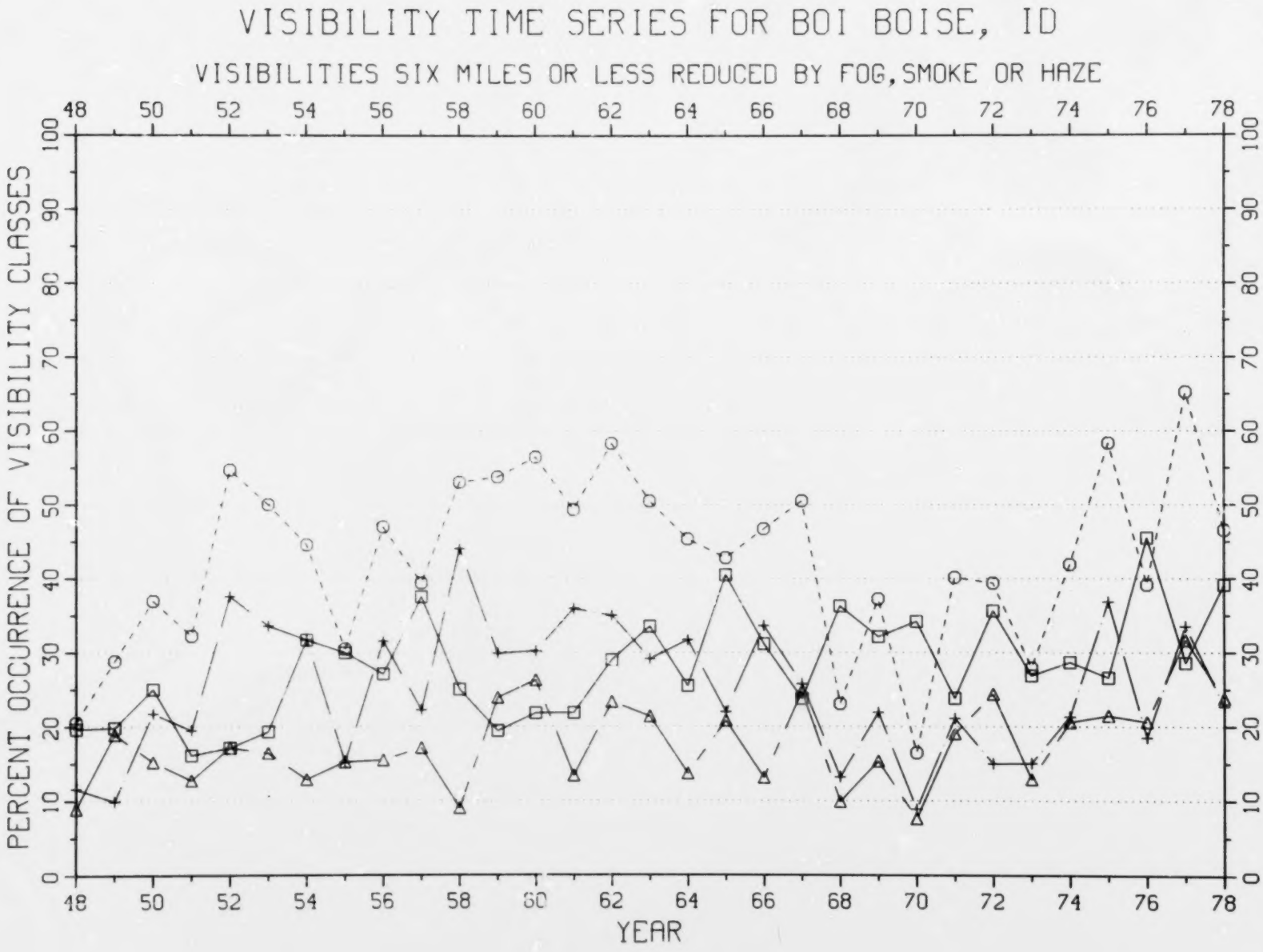
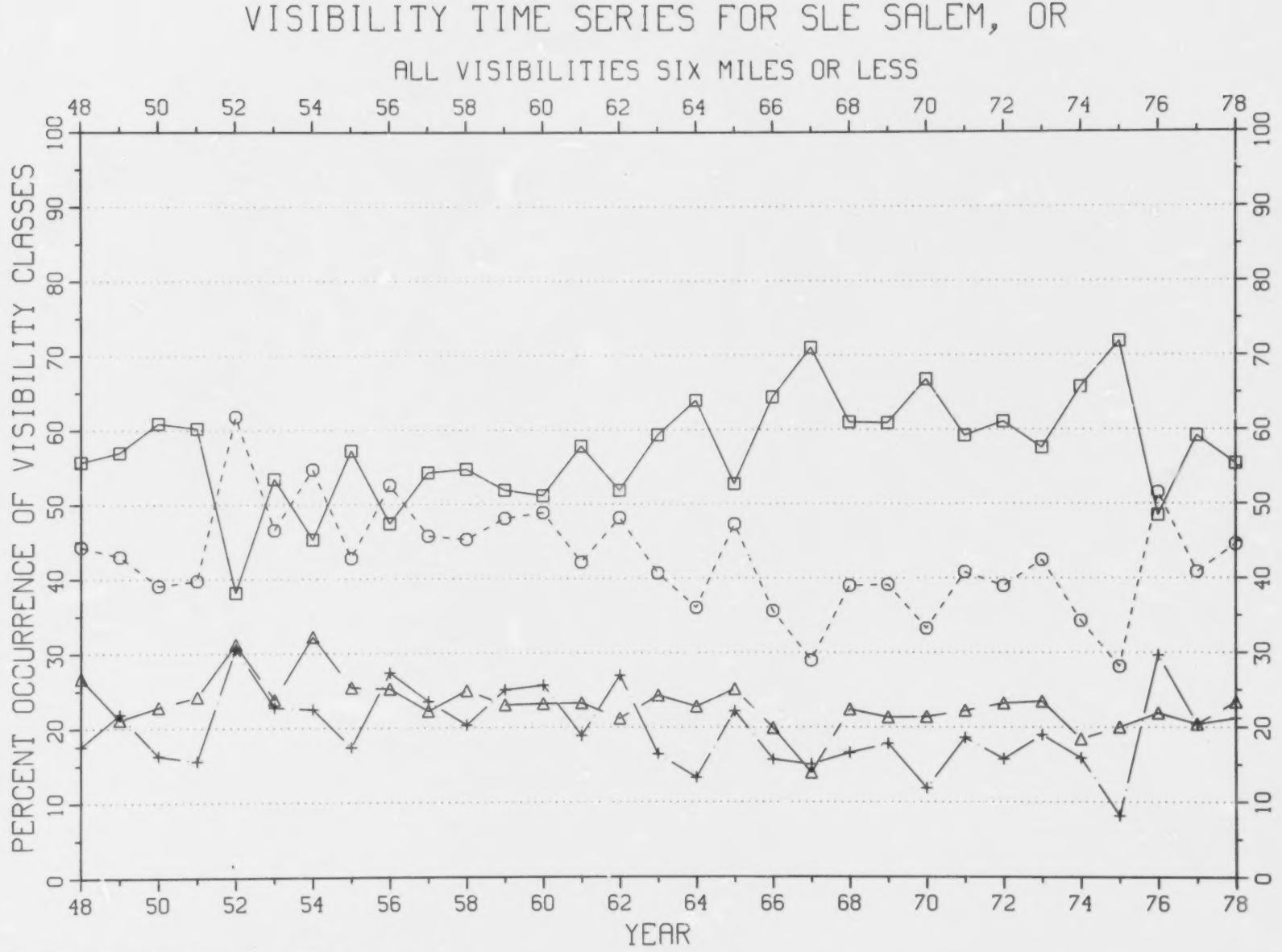

VISIBILITY TIME SERIES FOR BOI BOISE, ID
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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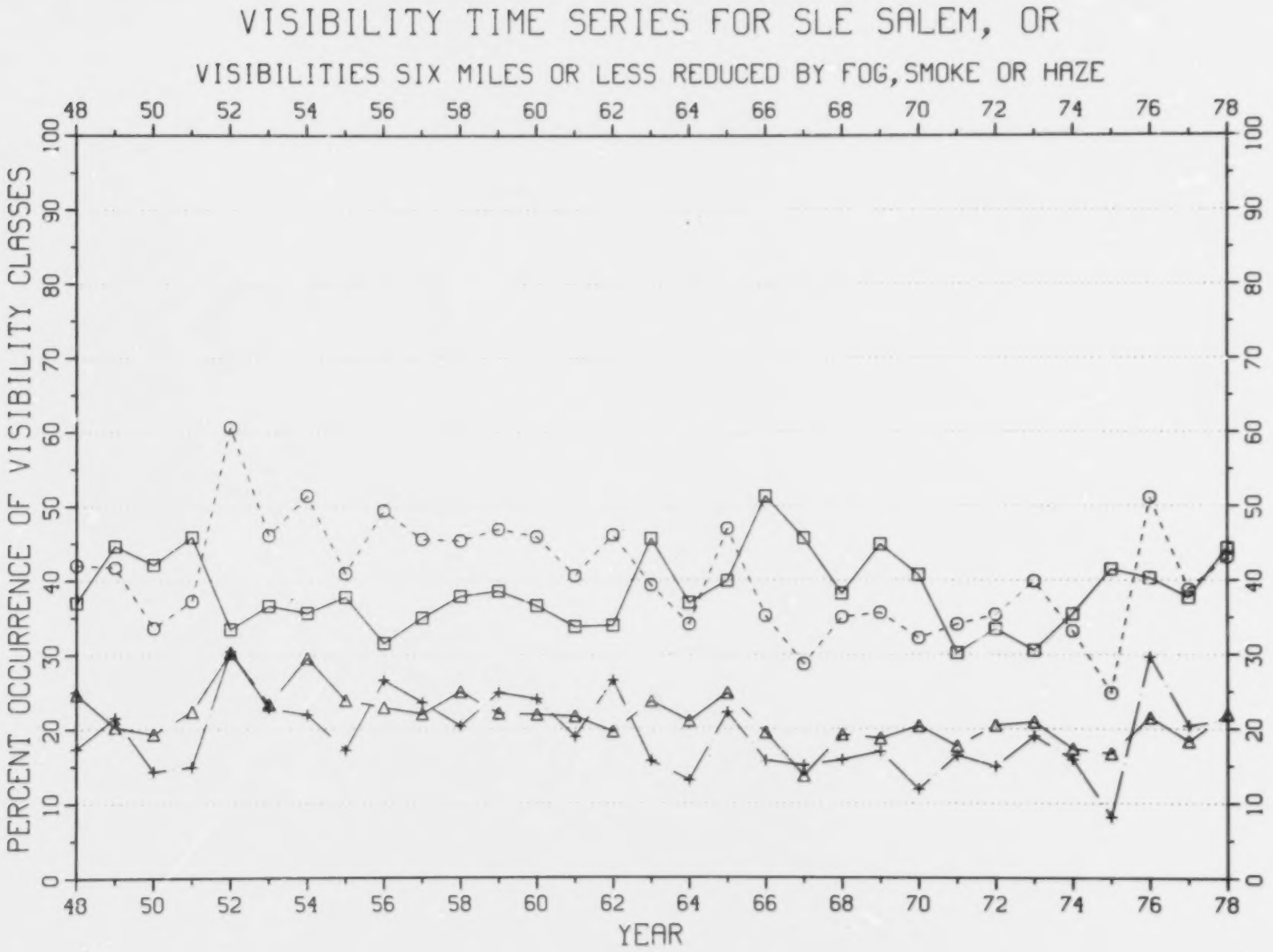

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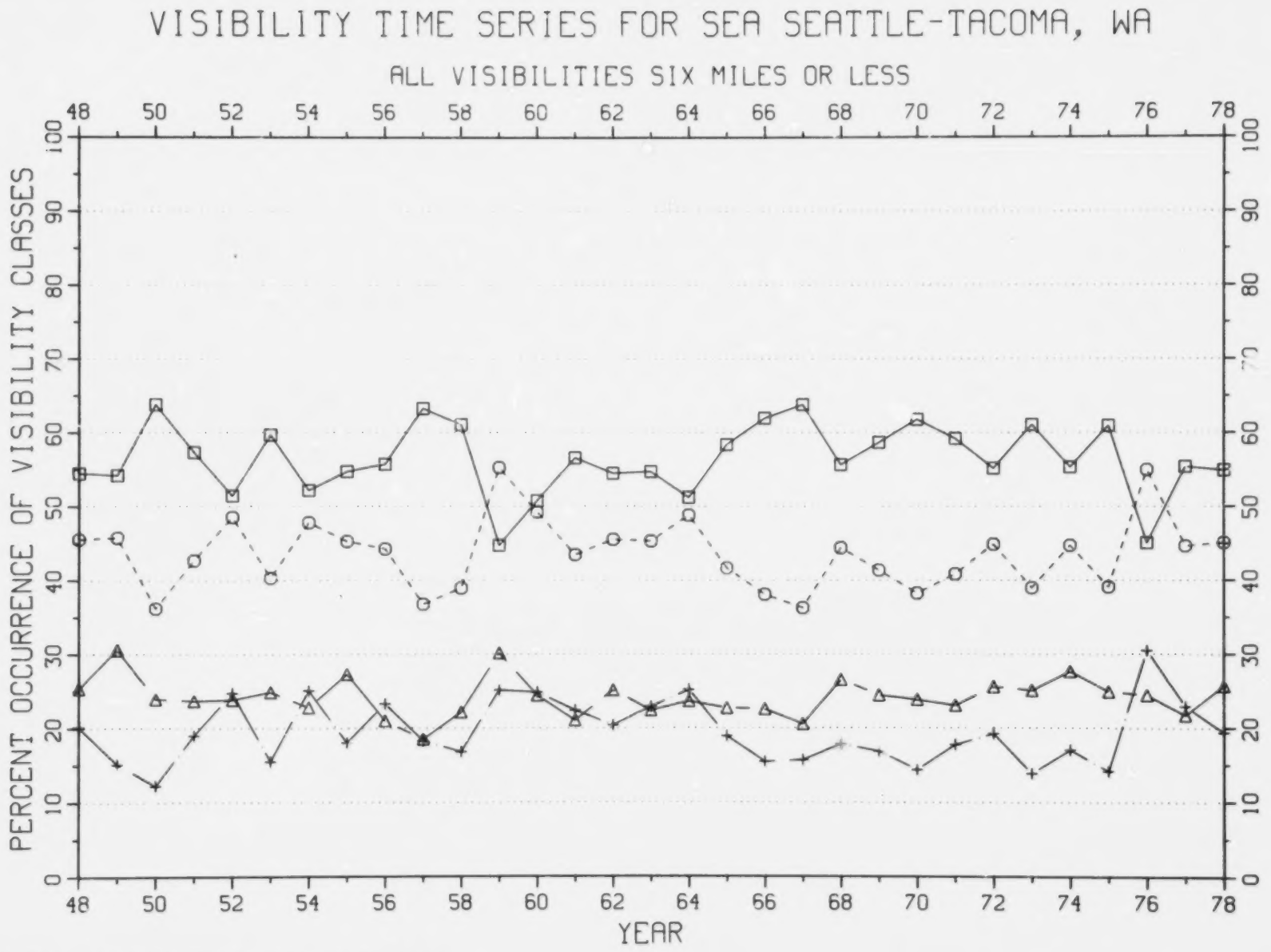
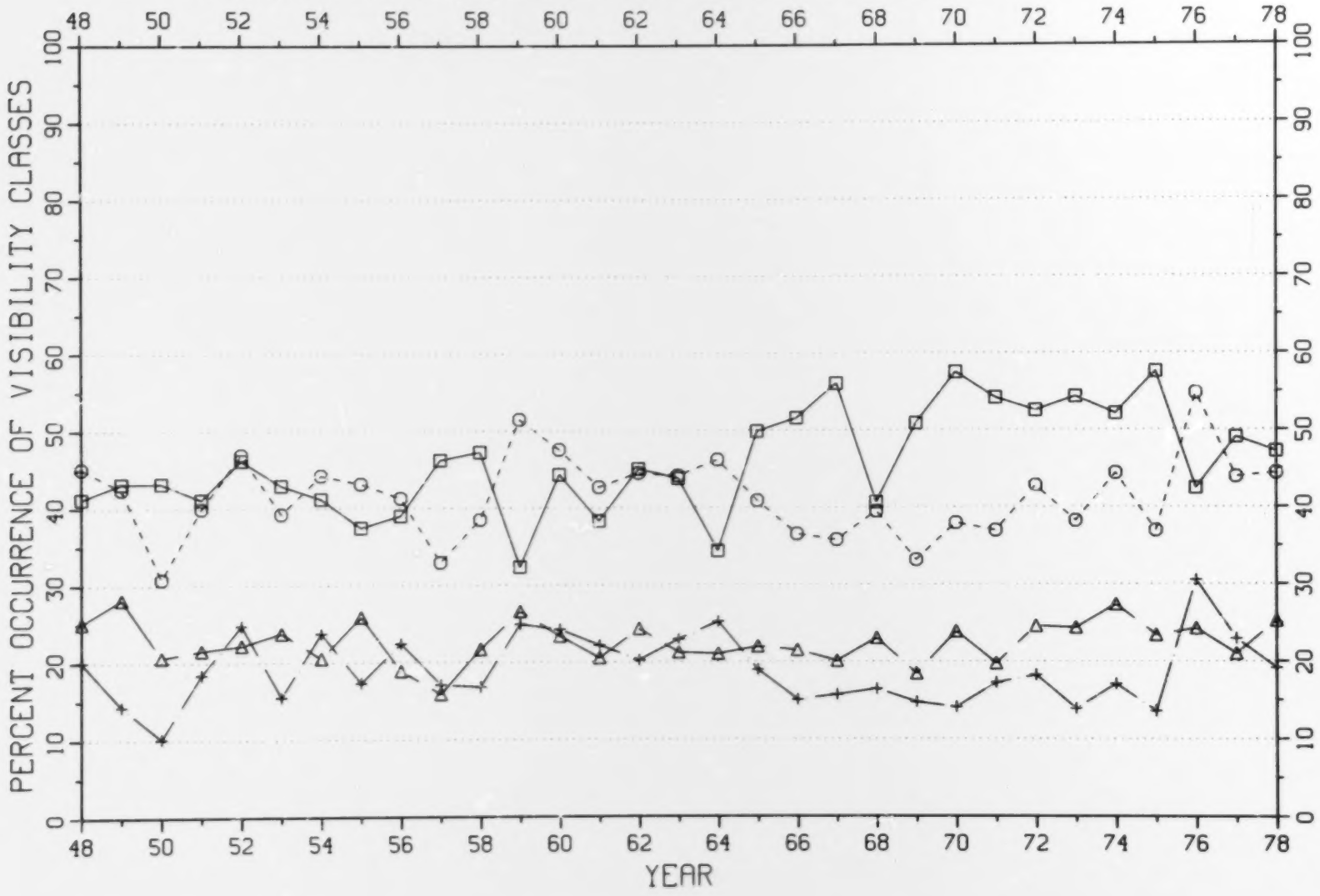


BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR SEA SEATTLE-TACOMA, WA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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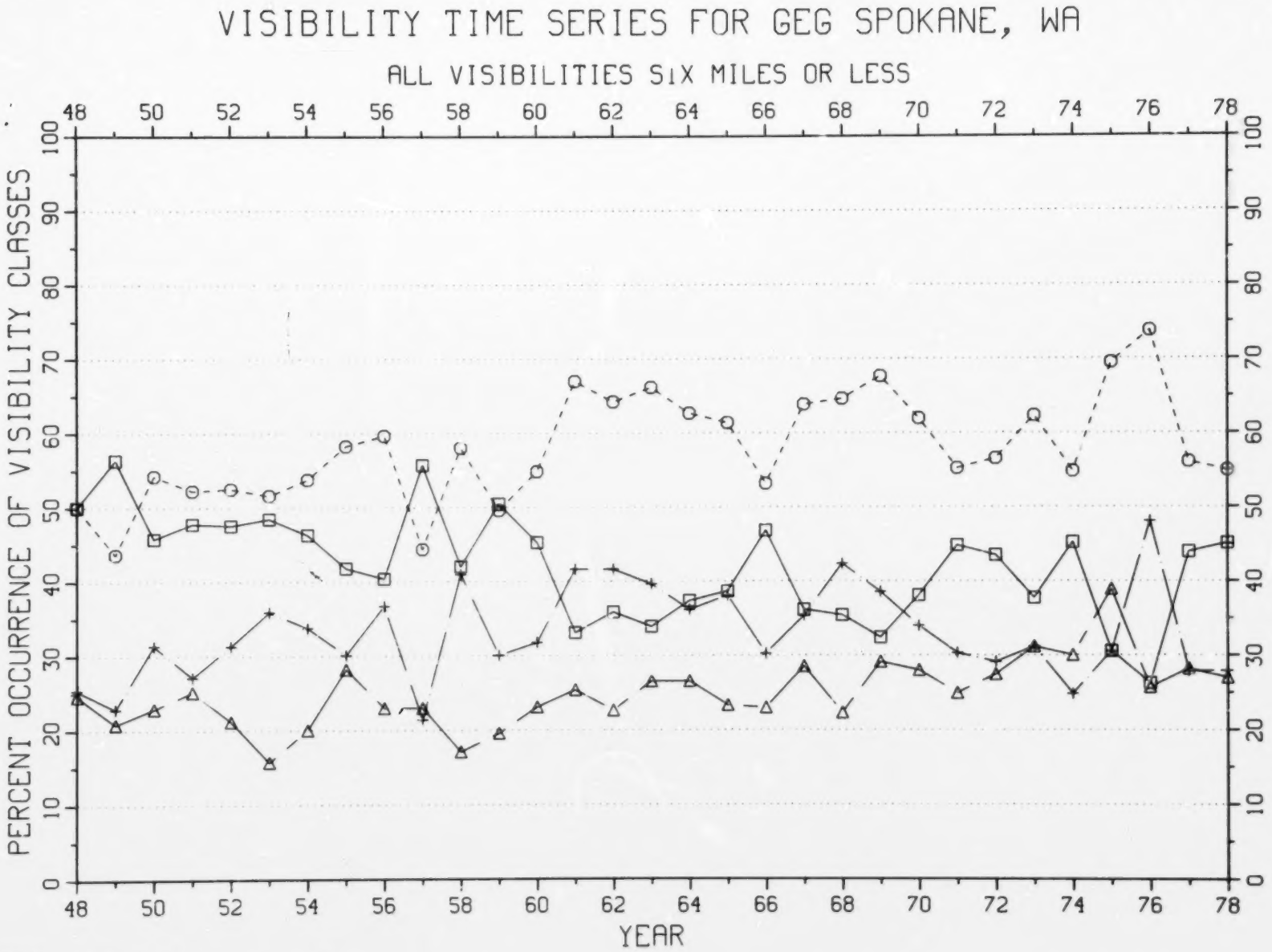

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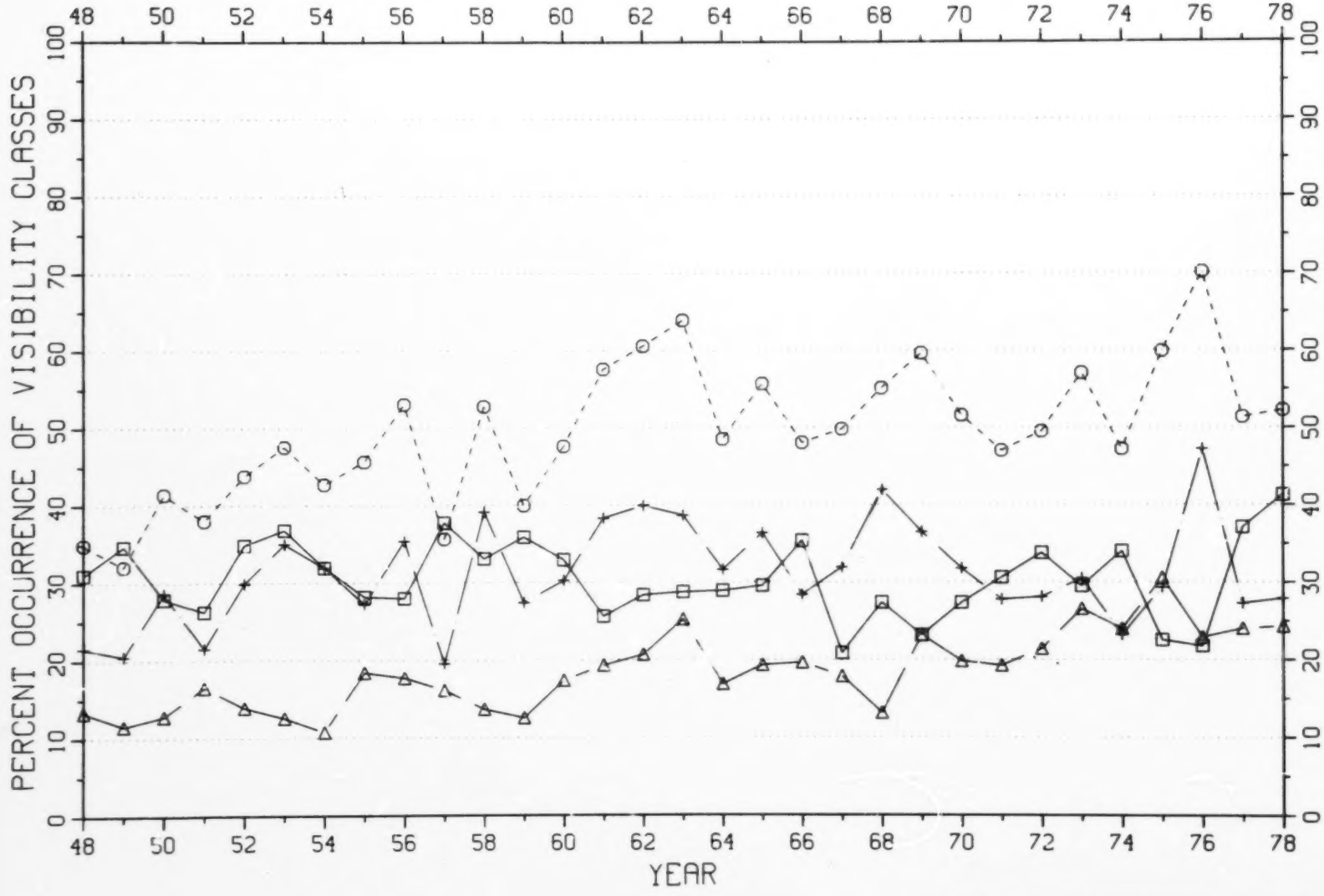
VISIBILITY TIME SERIES FOR GEG SPOKANE, WA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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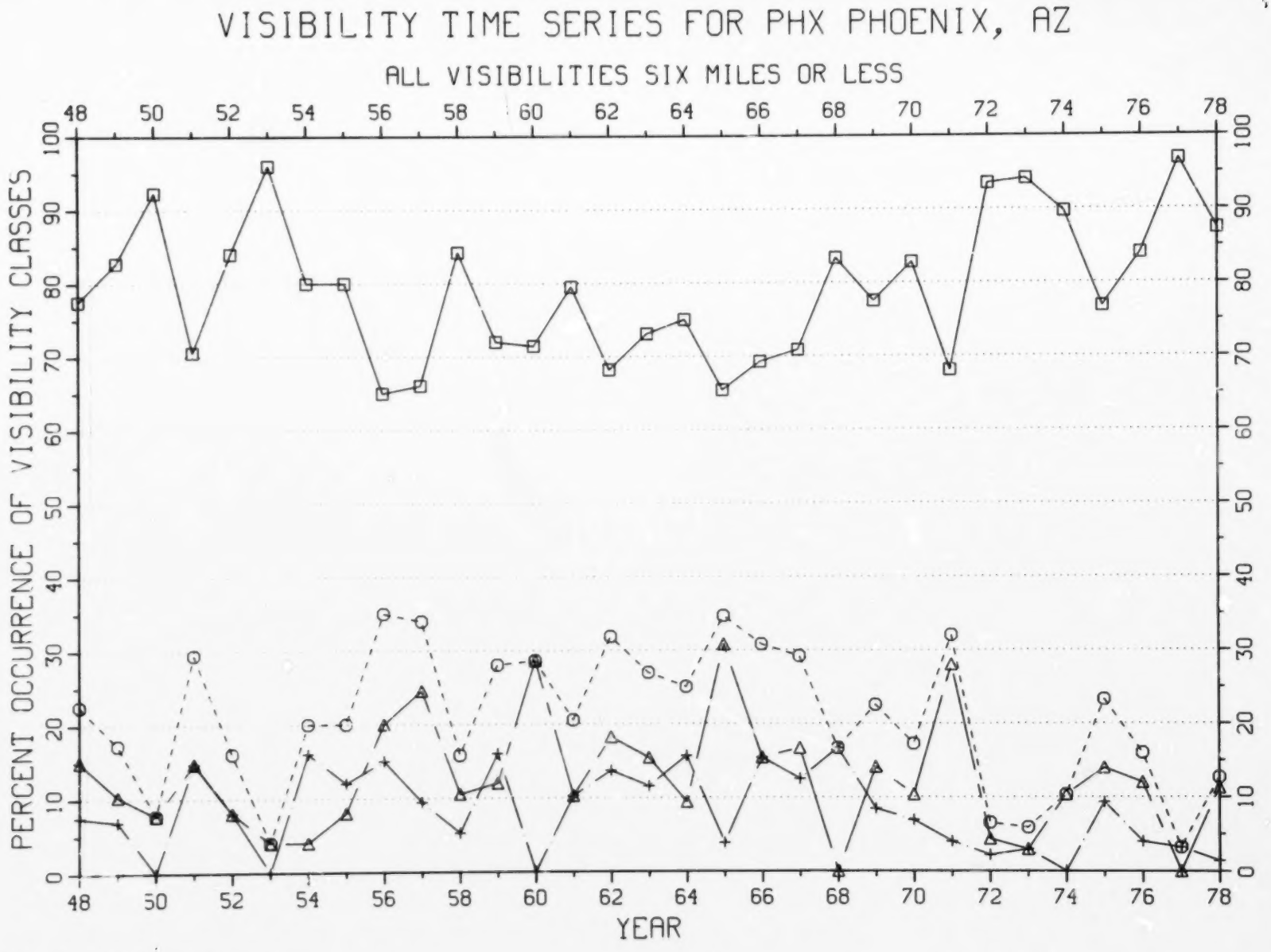

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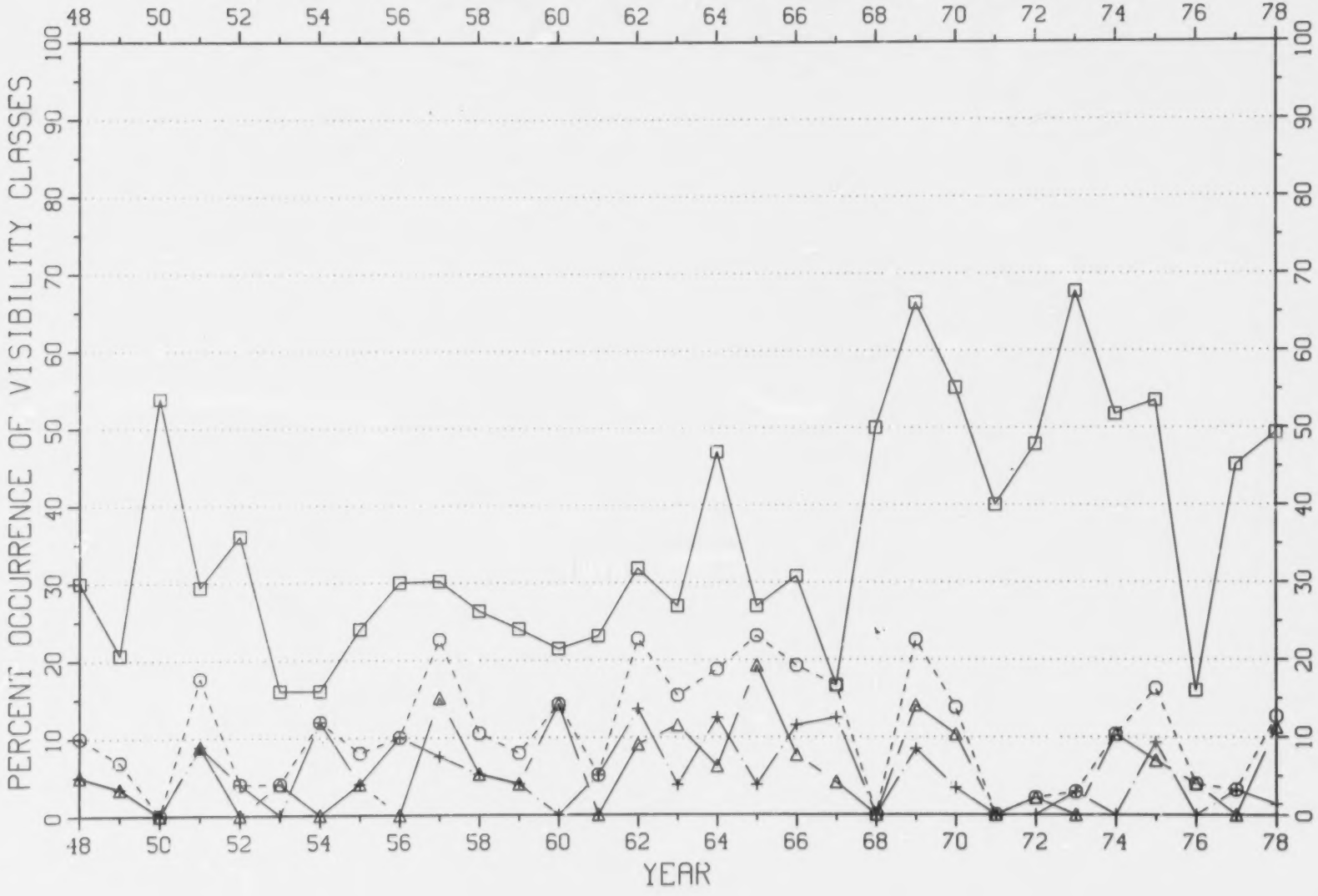
VISIBILITY TIME SERIES FOR PHX PHOENIX, AZ

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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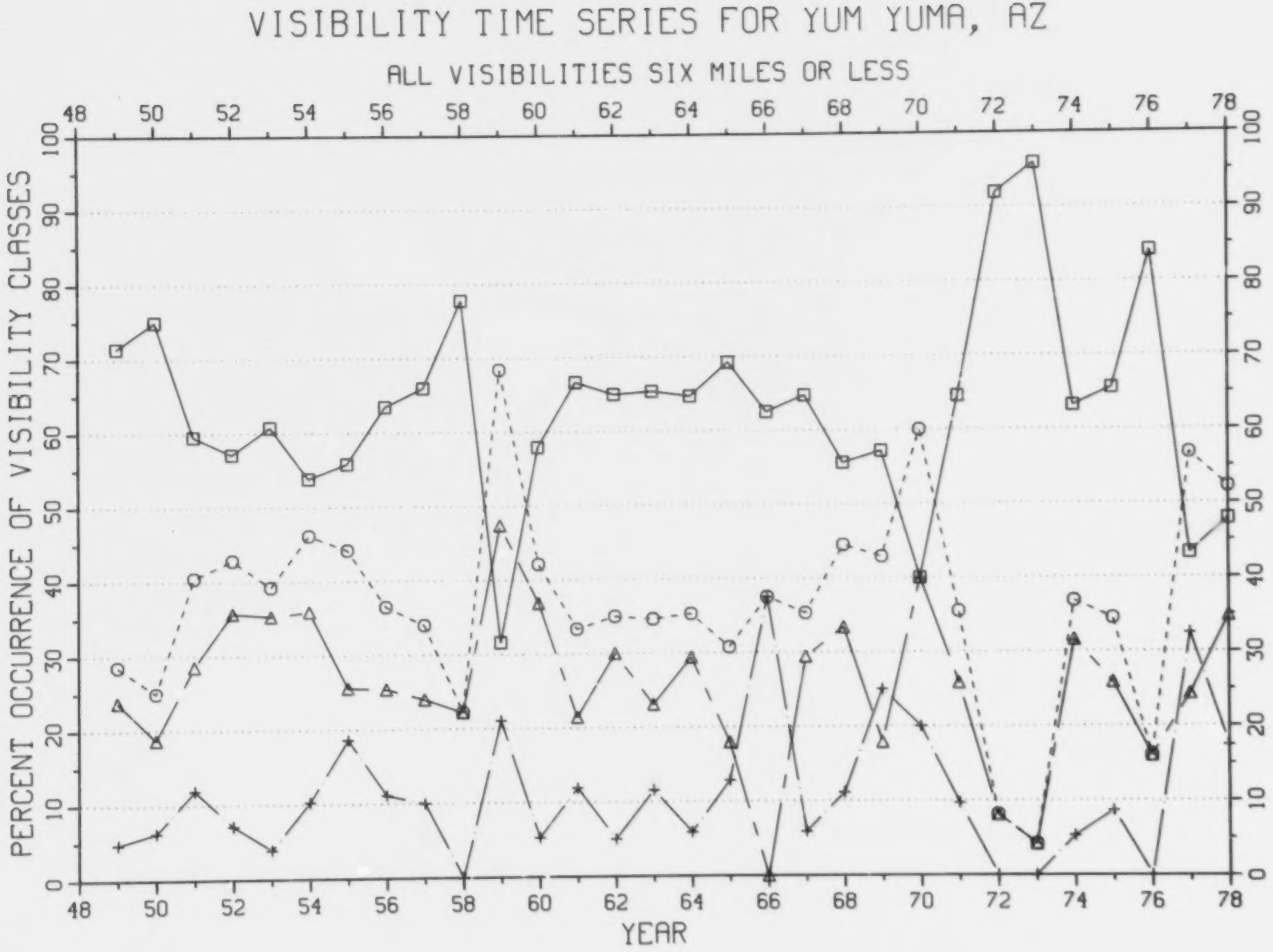
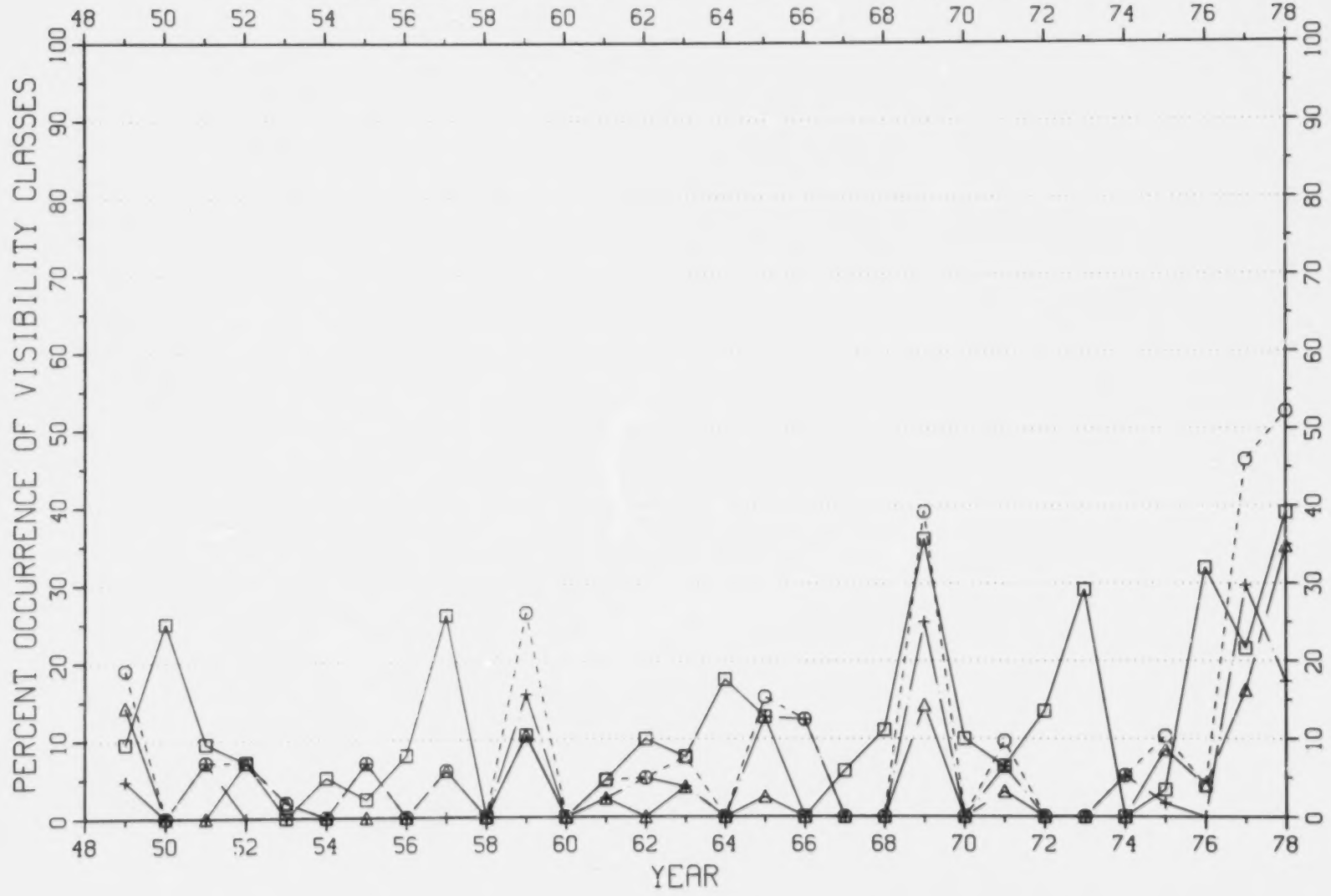

VISIBILITY TIME SERIES FOR YUM YUMA, AZ
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR YUM YUMA, AZ

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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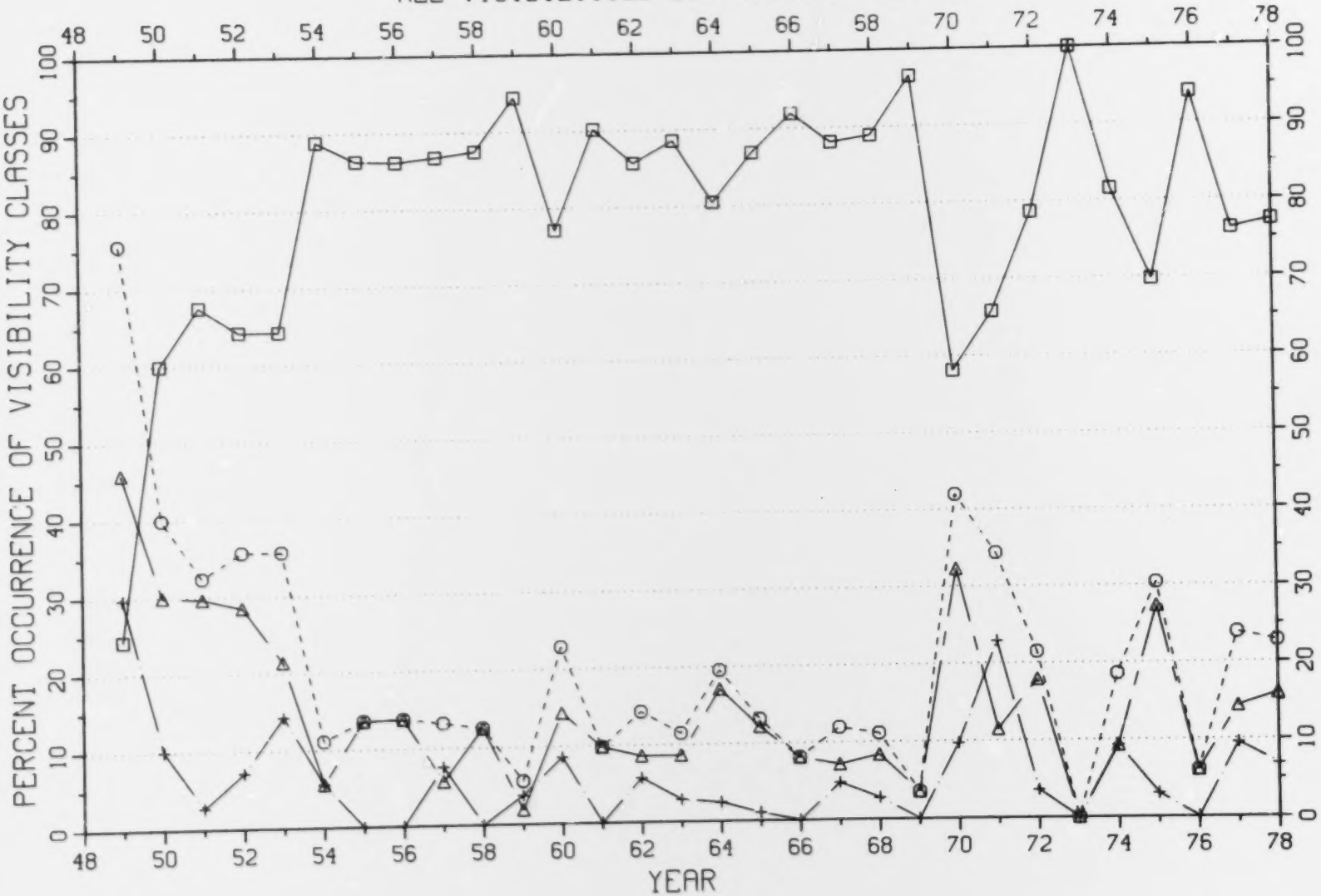
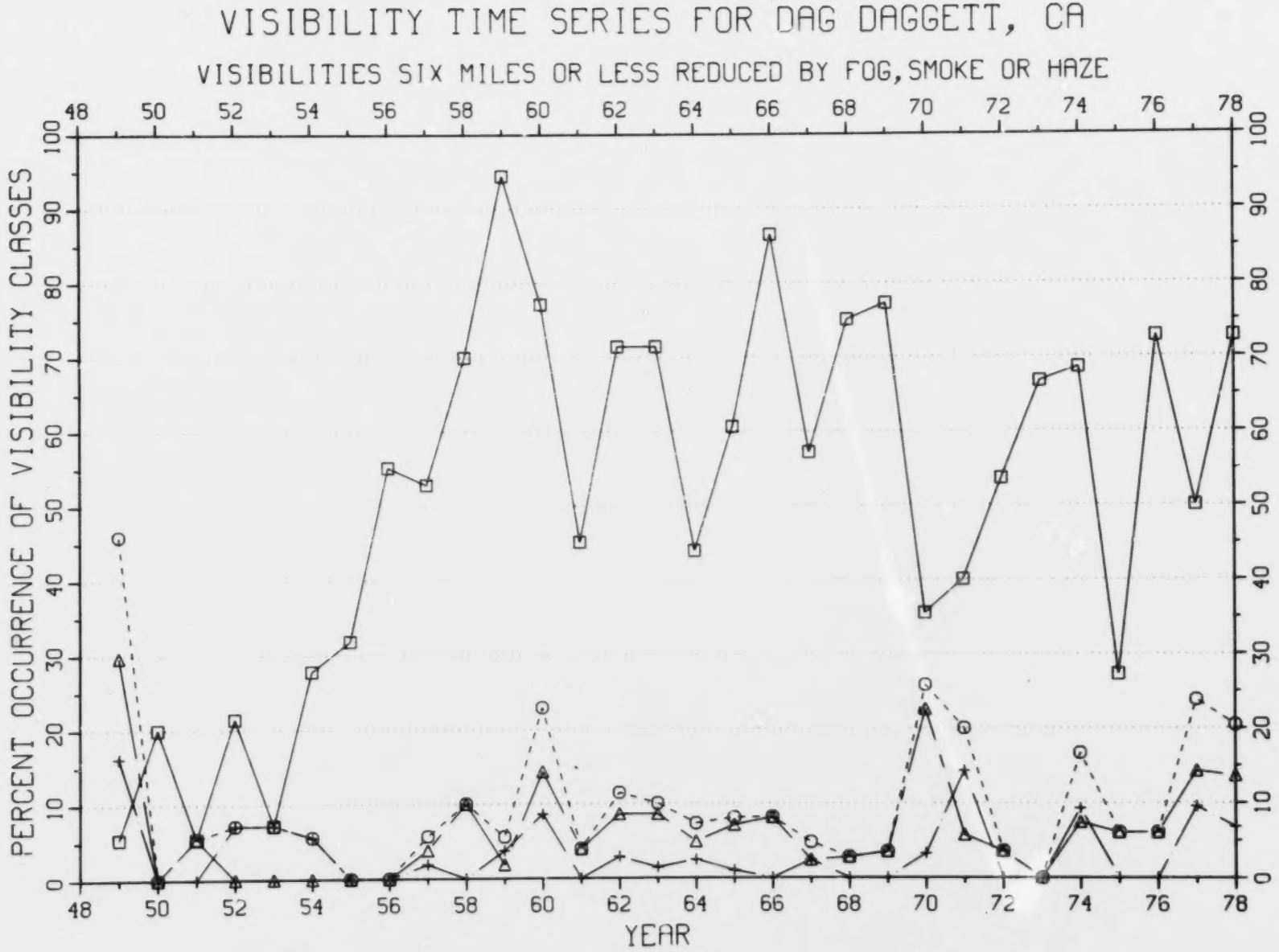

VISIBILITY TIME SERIES FOR DAG DAGGETT, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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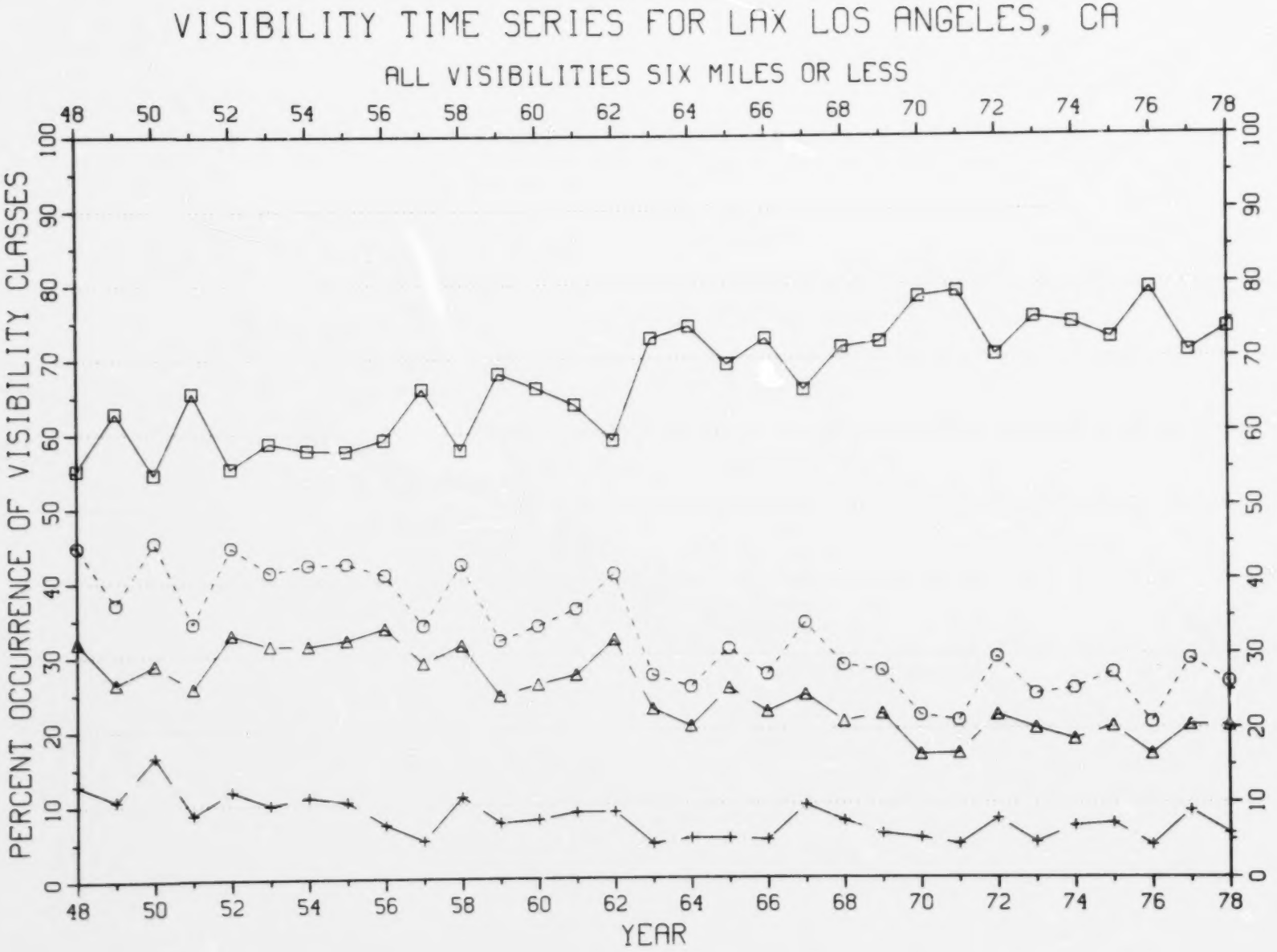
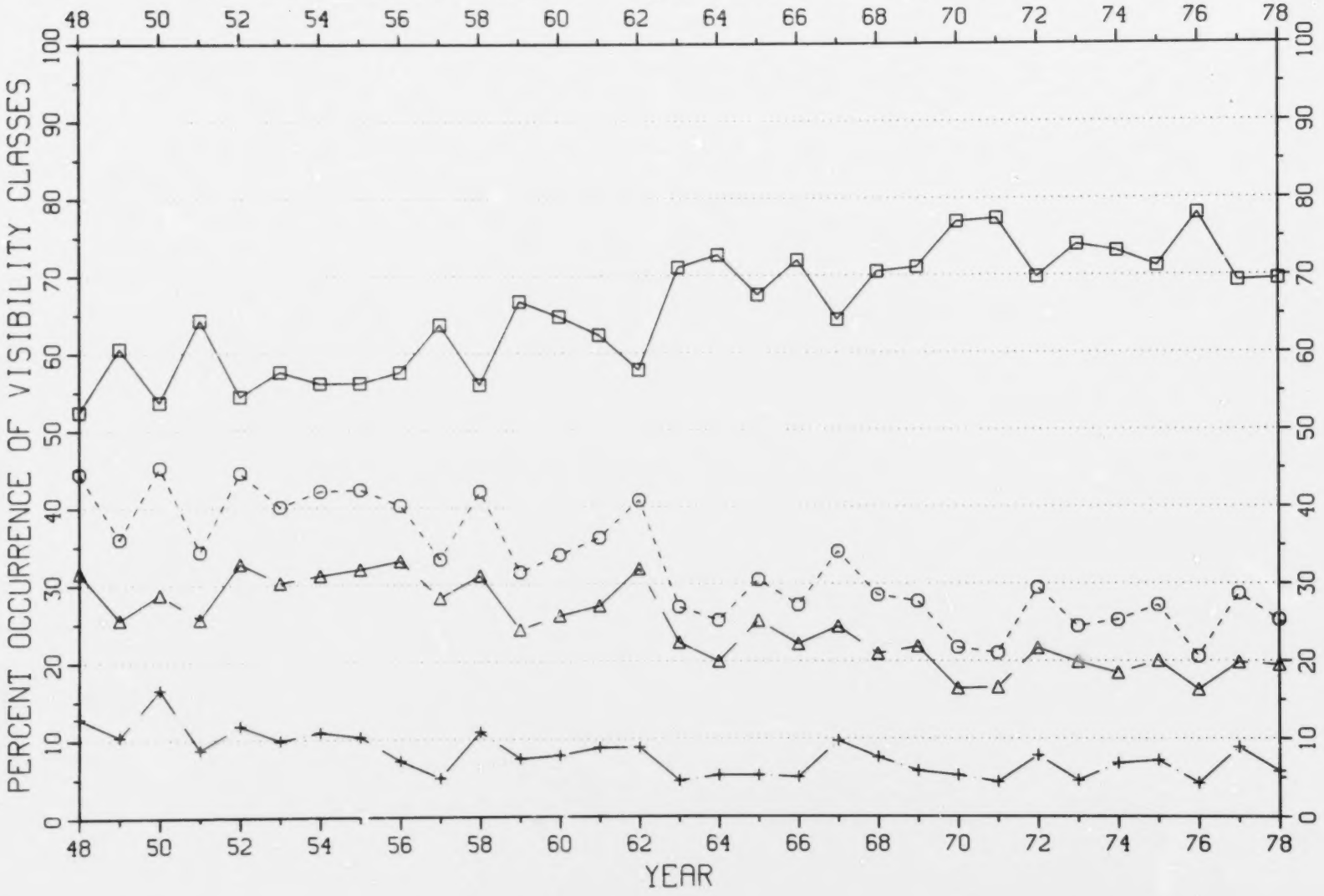

VISIBILITY TIME SERIES FOR LAX LOS ANGELES, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR LAX LOS ANGELES, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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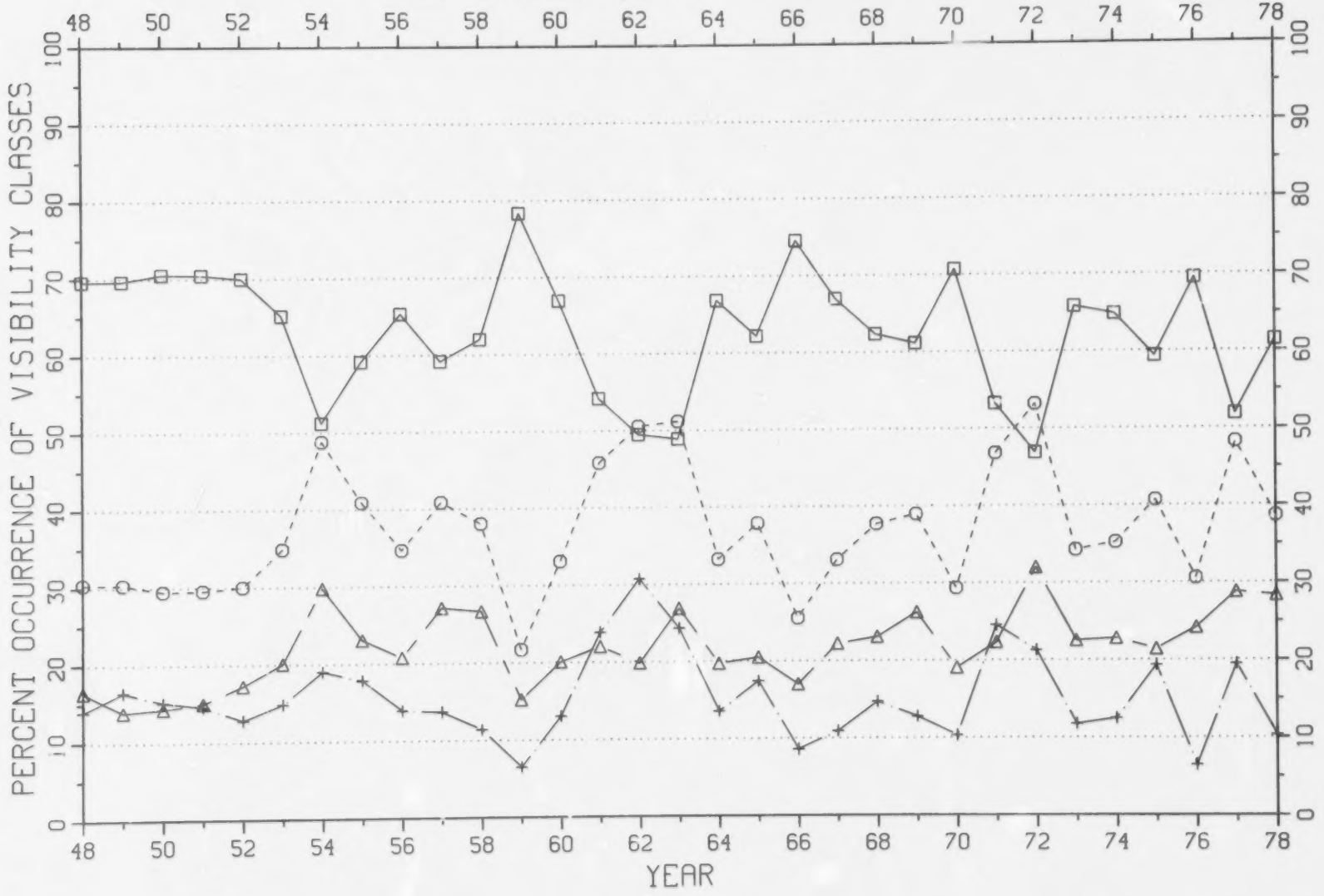
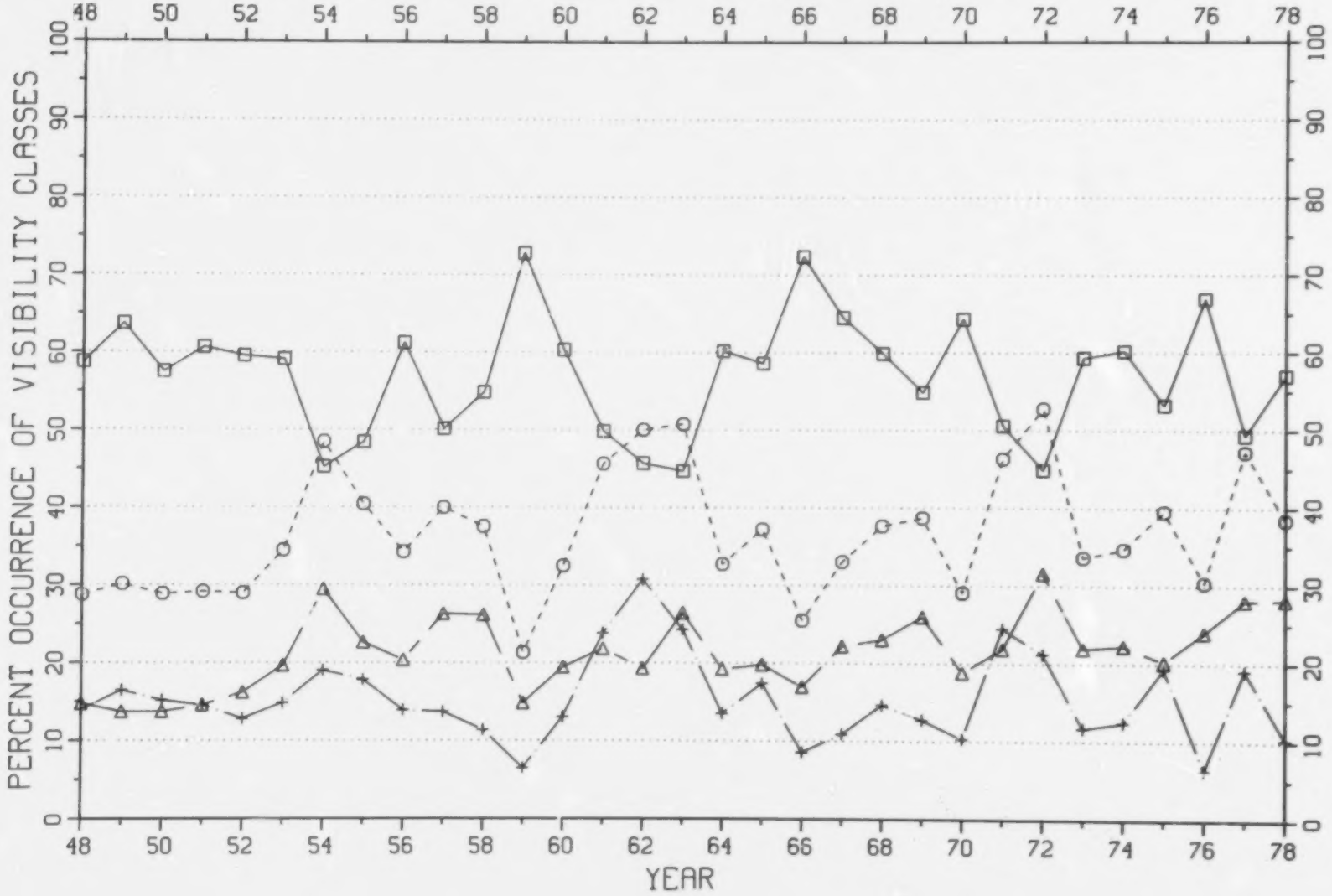

VISIBILITY TIME SERIES FOR SAC SACRAMENTO, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
0
10
20
30
40
50
60
70
80
90
100

VISIBILITY TIME SERIES FOR SAC SACRAMENTO, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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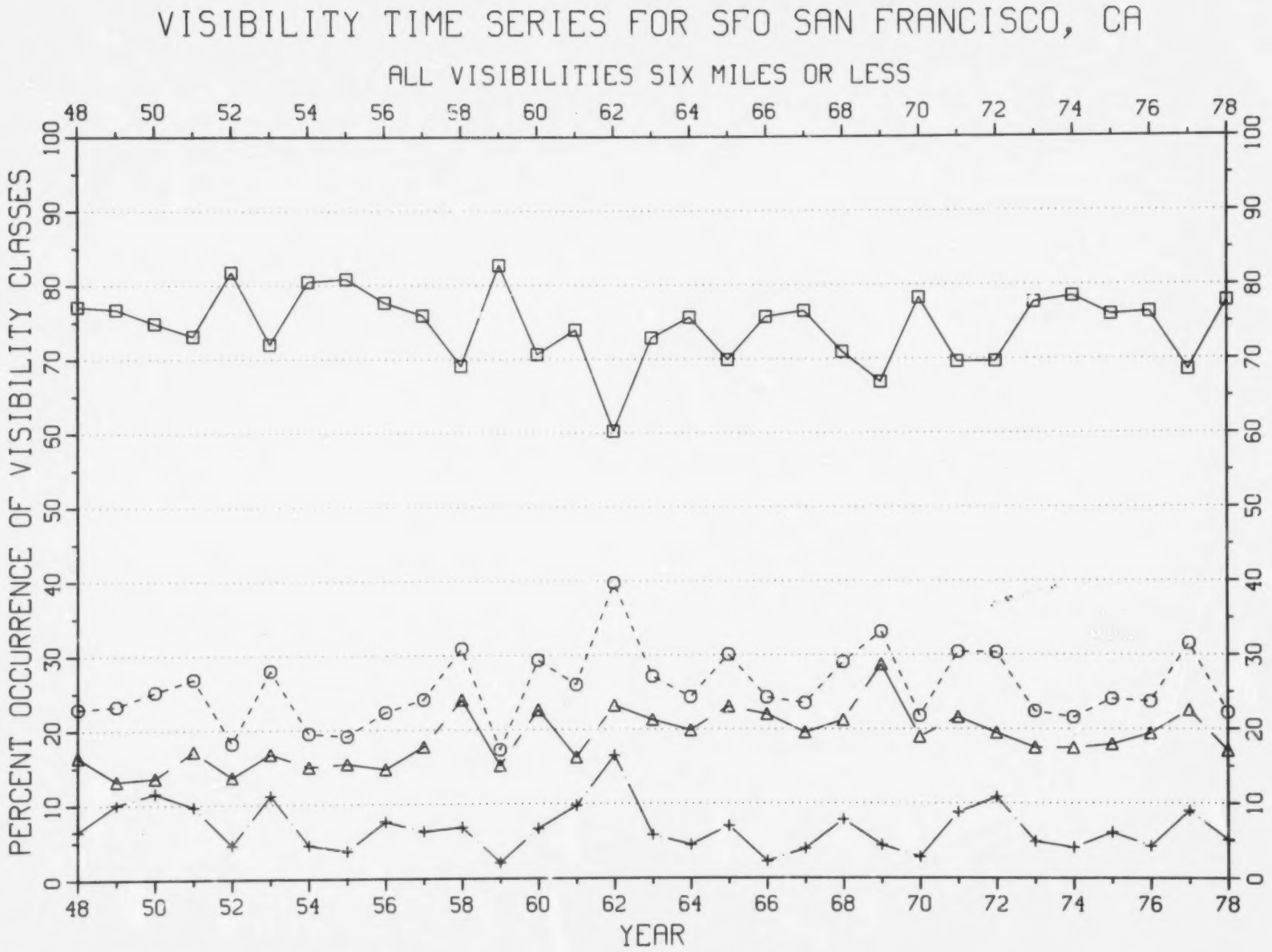

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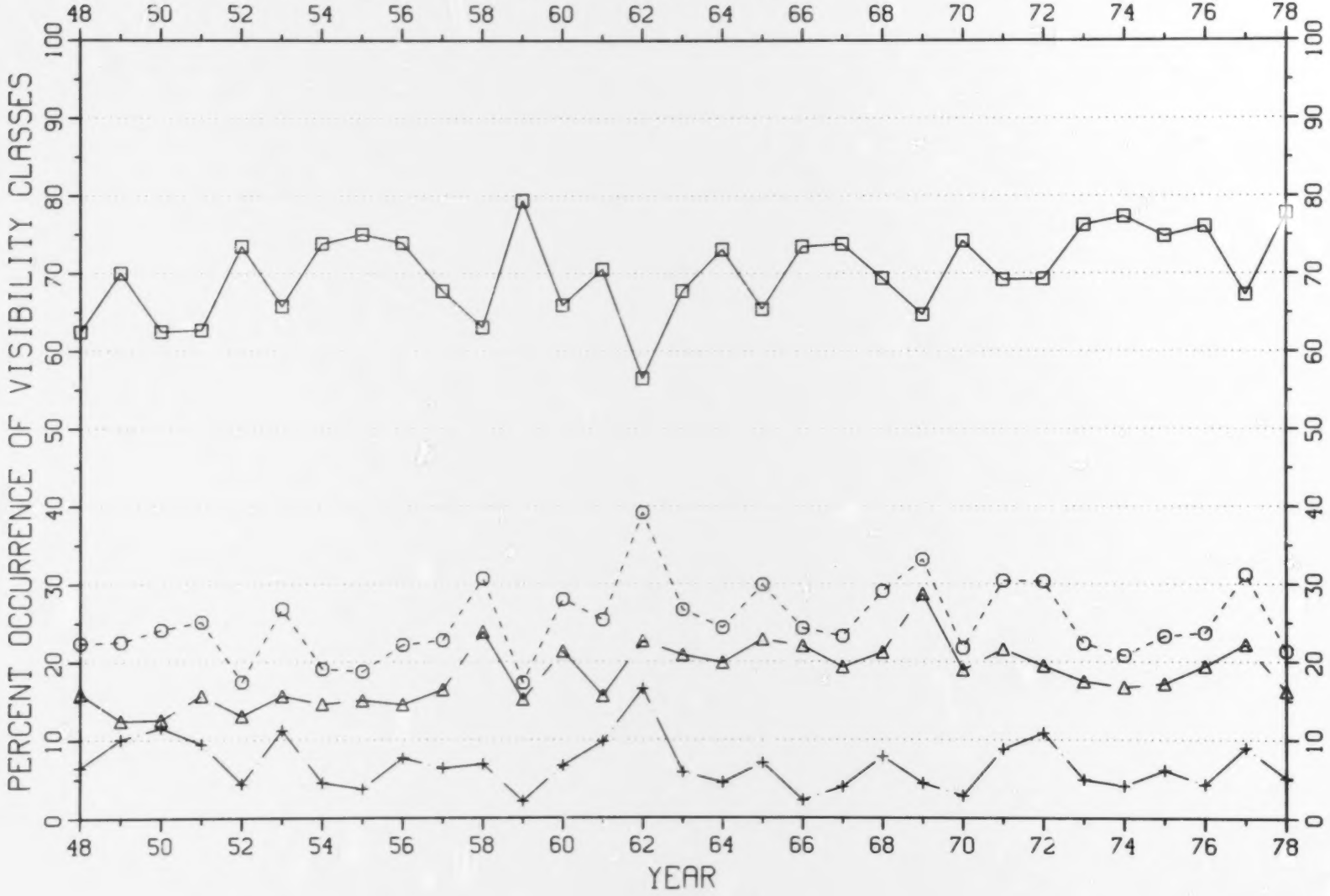
VISIBILITY TIME SERIES FOR SFO SAN FRANCISCO, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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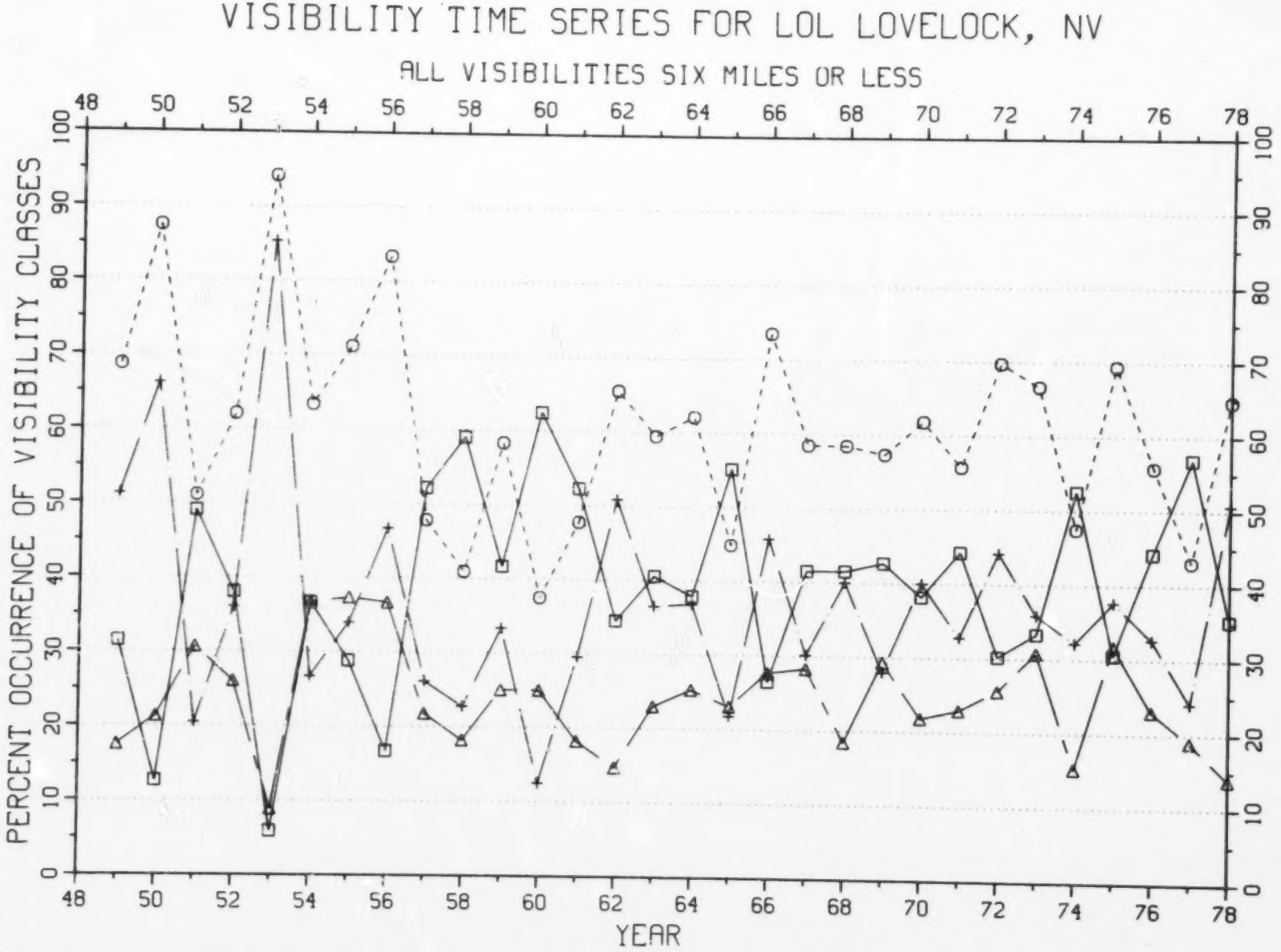
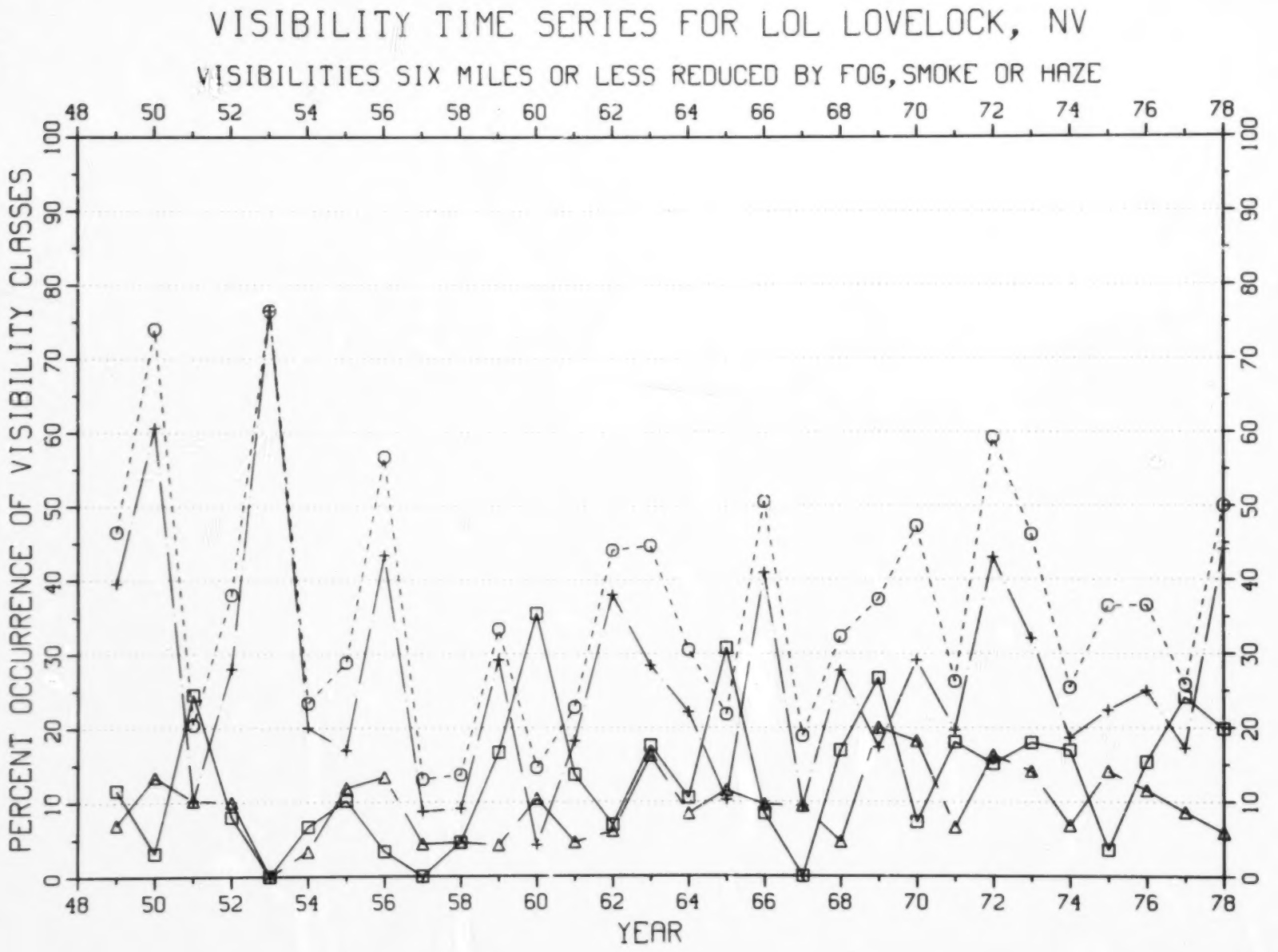

VISIBILITY TIME SERIES FOR LOL LOVELOCK, NV
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE



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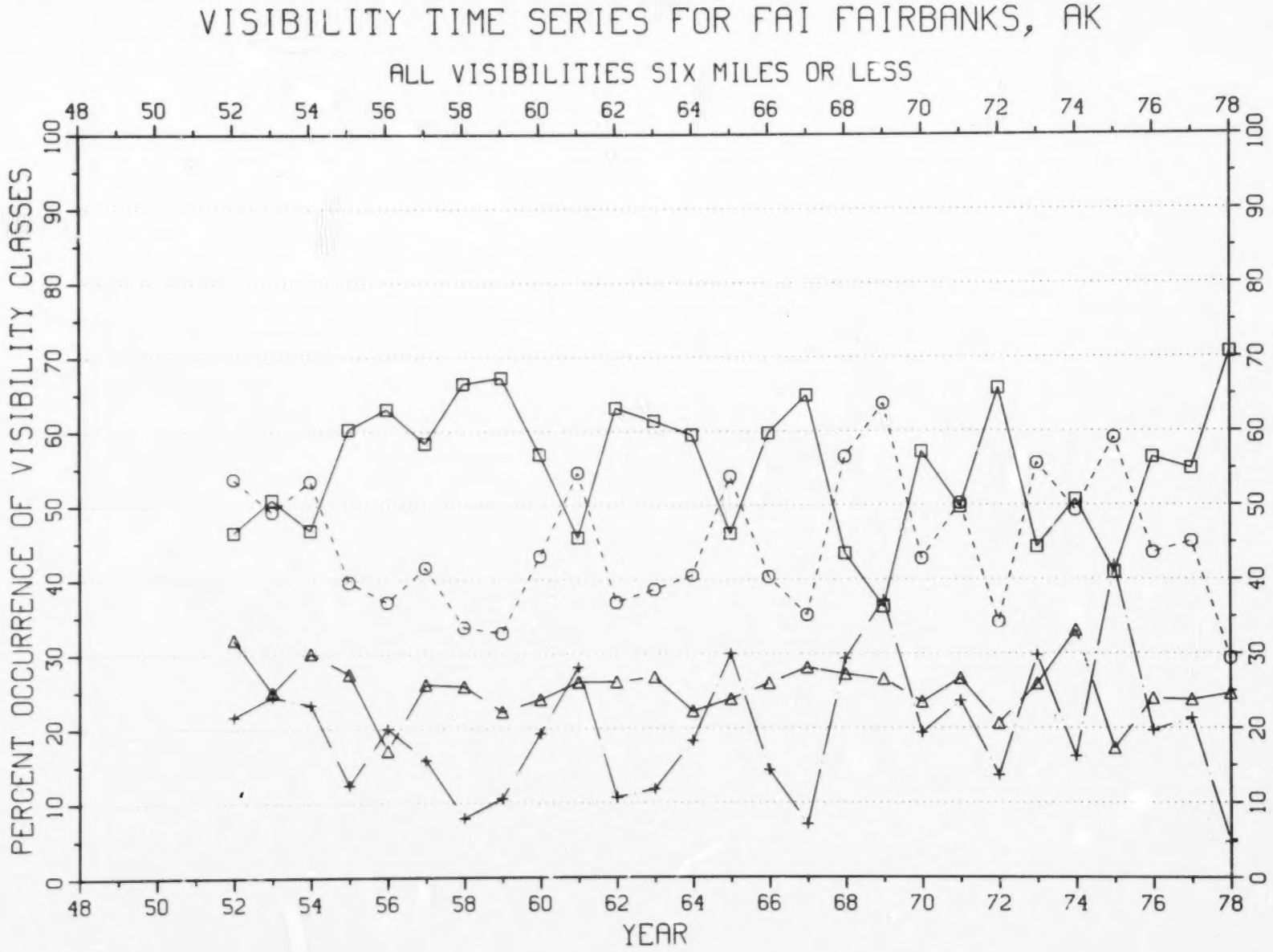

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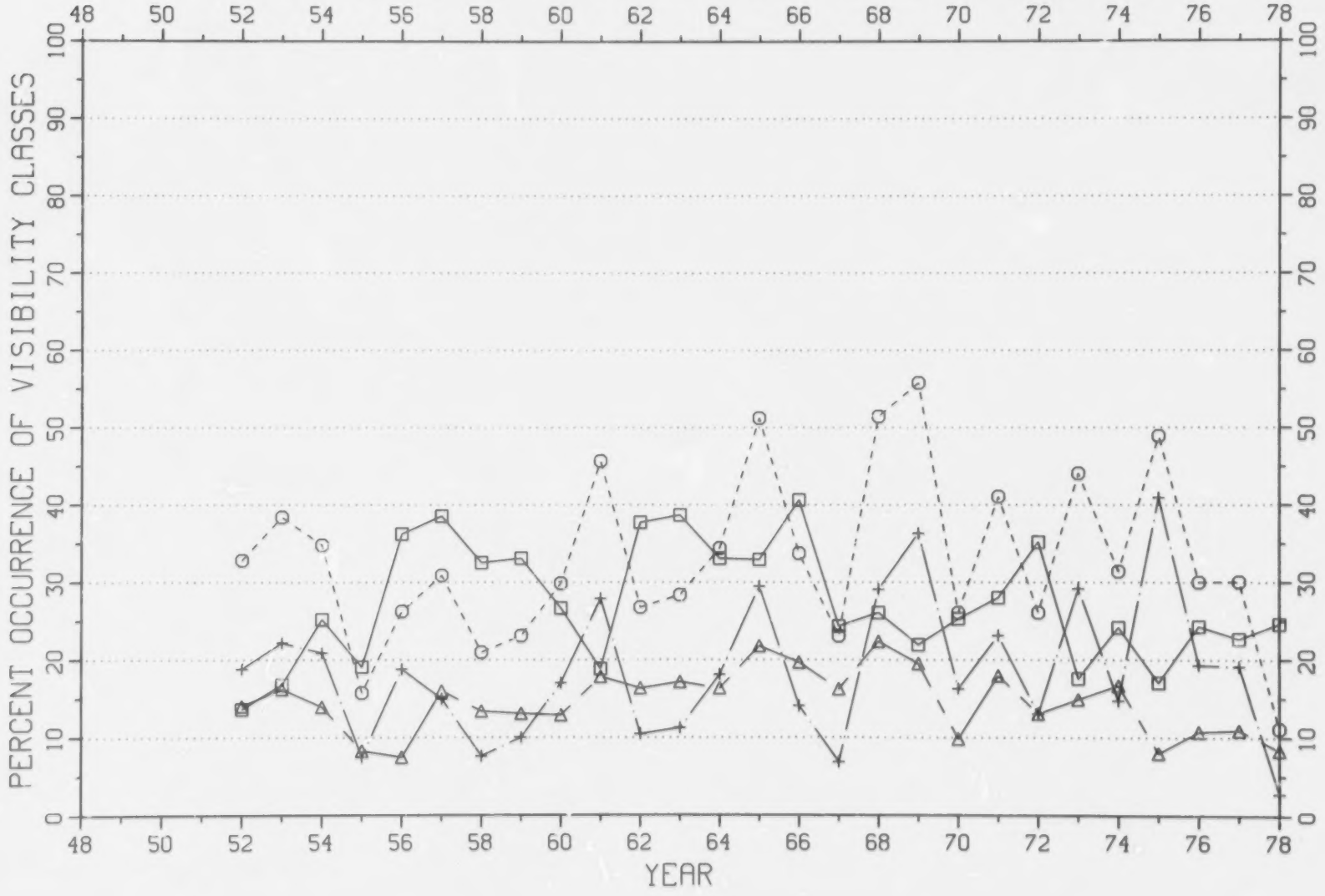
VISIBILITY TIME SERIES FOR FAI FAIRBANKS, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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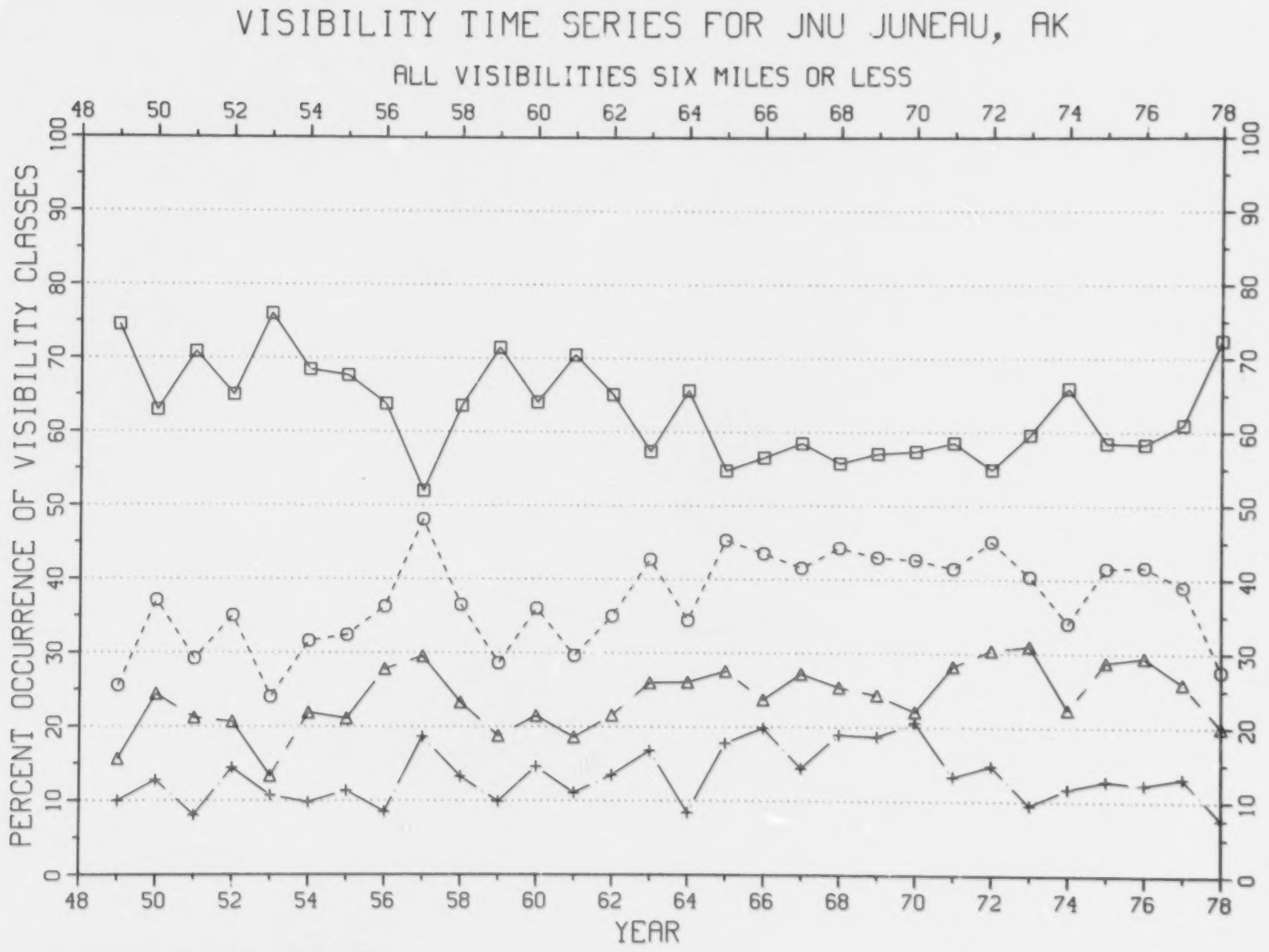

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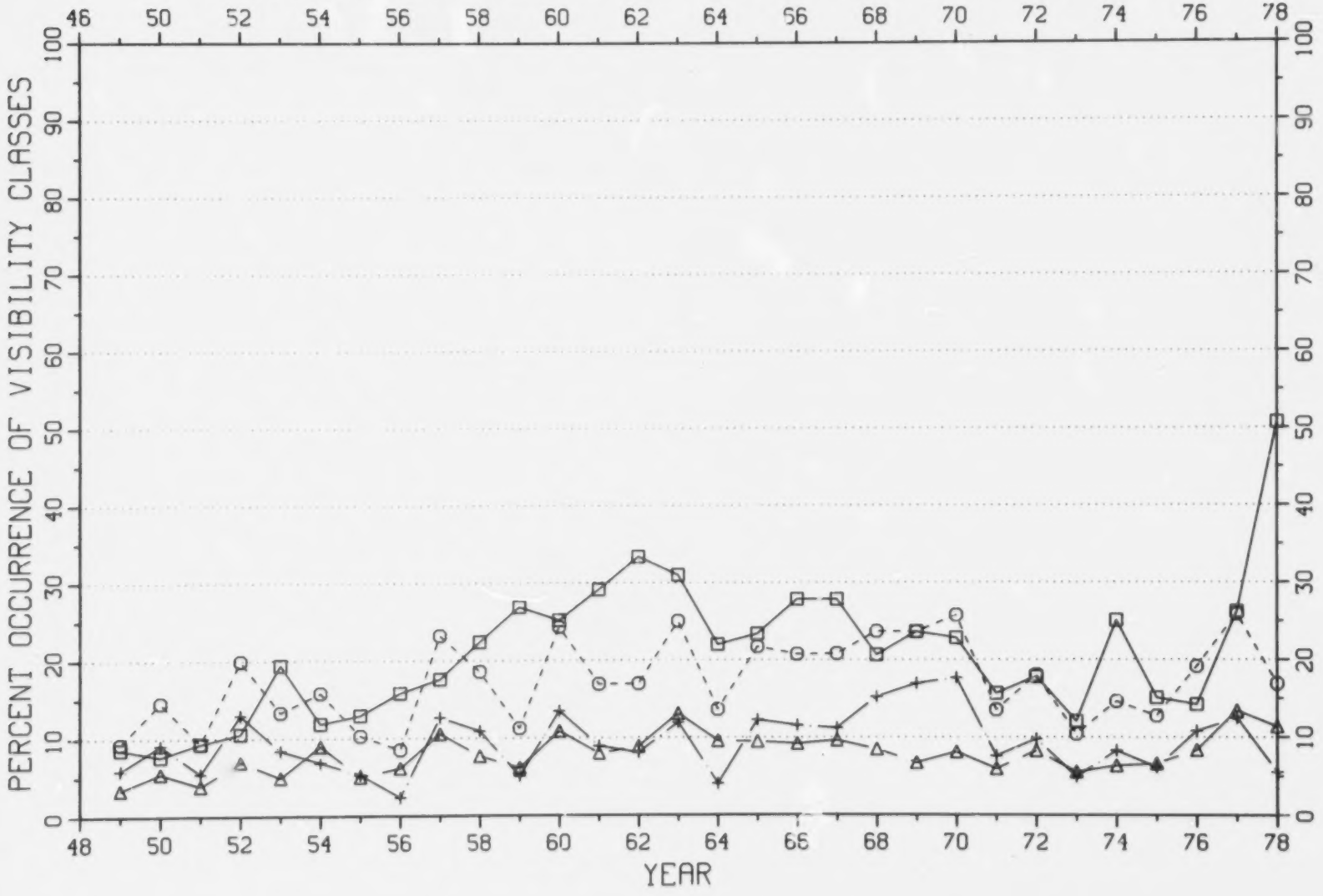
VISIBILITY TIME SERIES FOR JNU JUNEAU, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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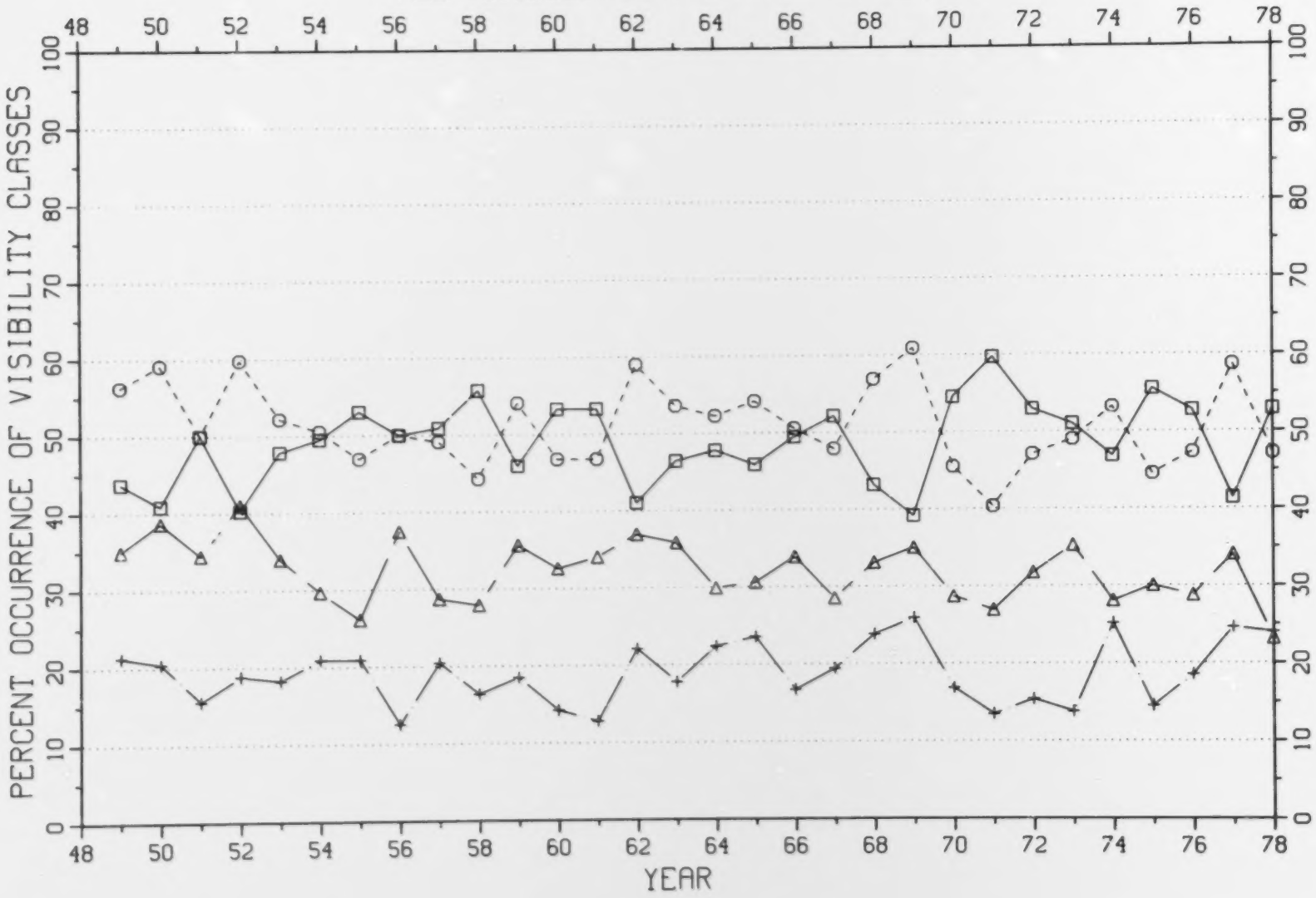

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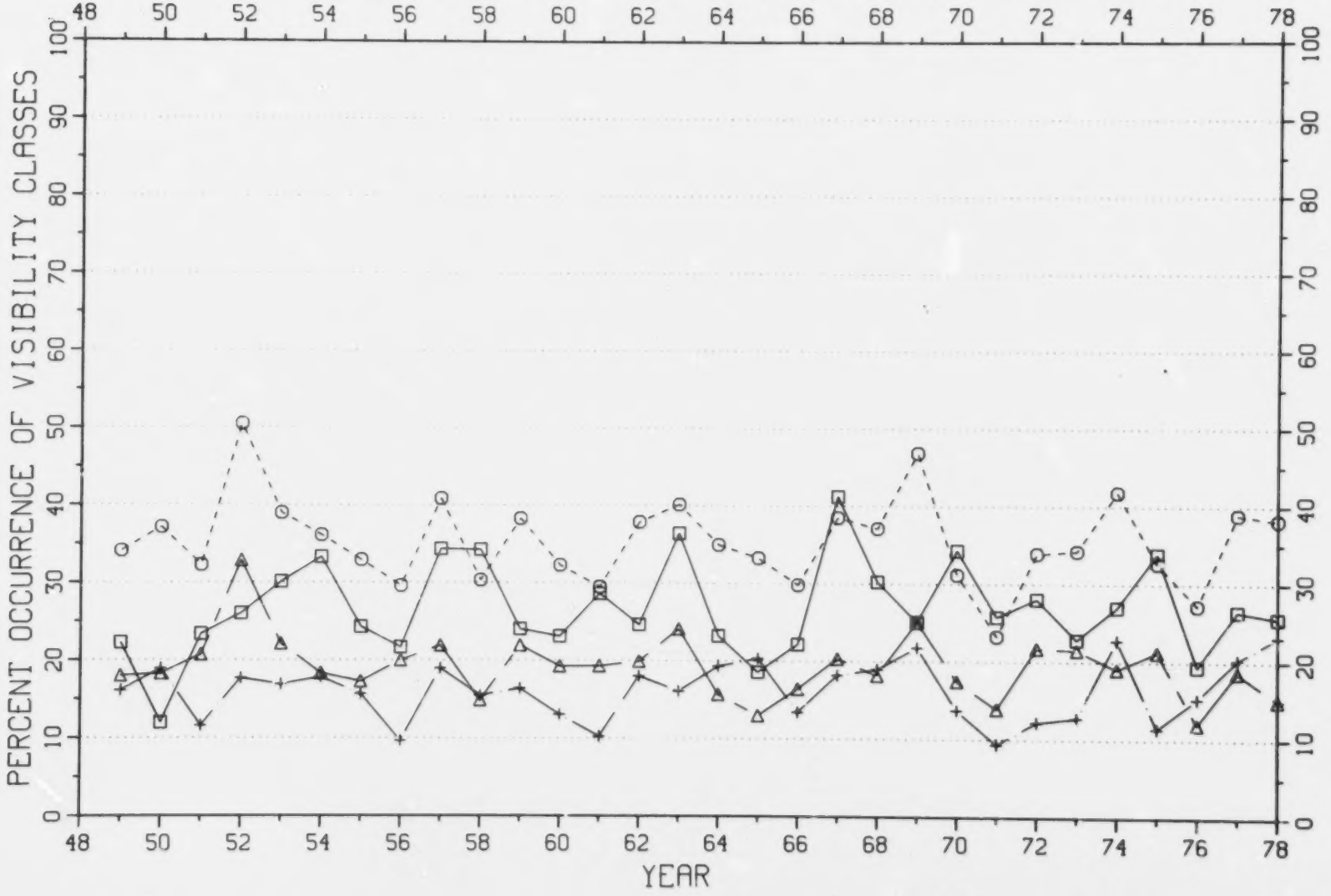
VISIBILITY TIME SERIES FOR AKN KING SALMON, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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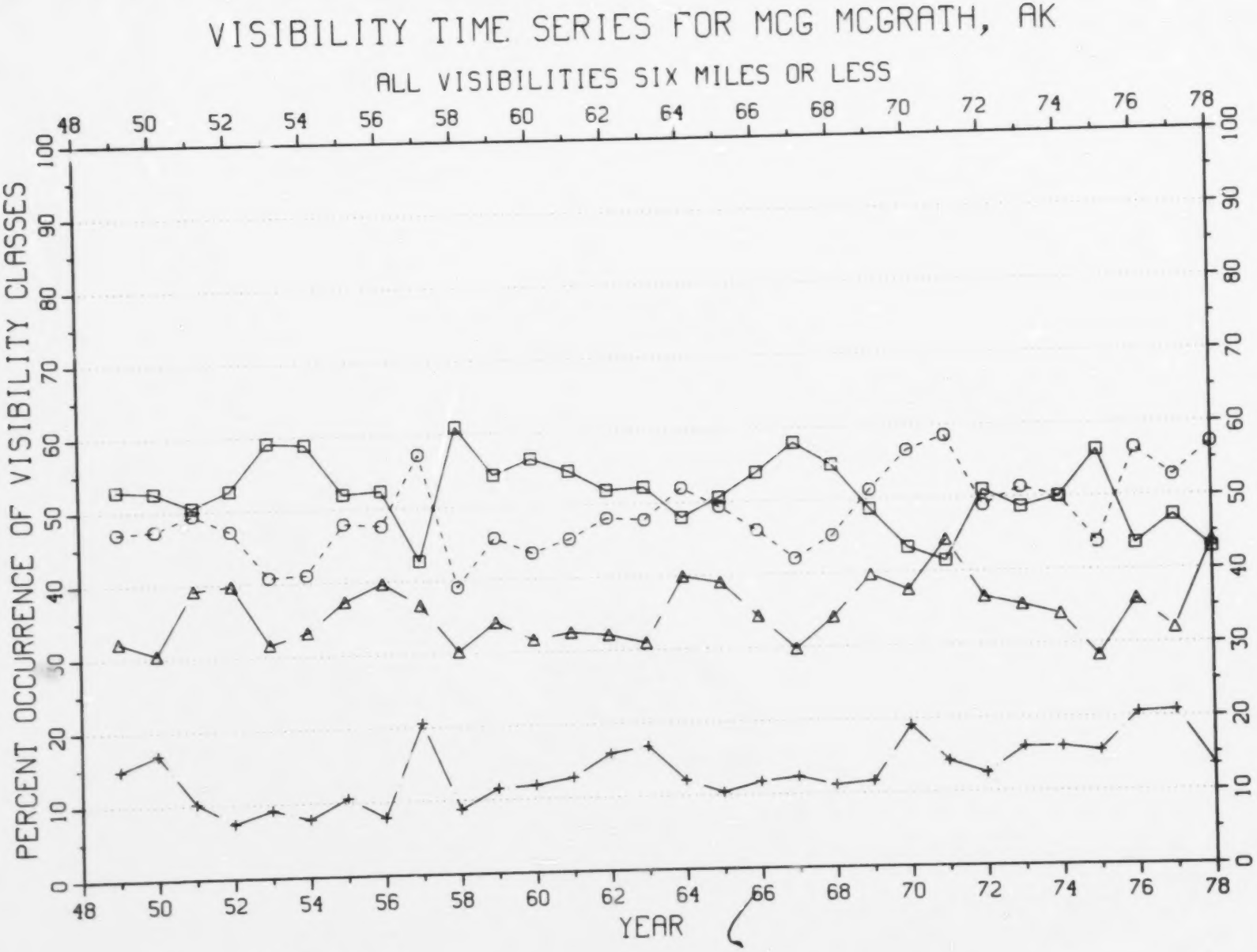
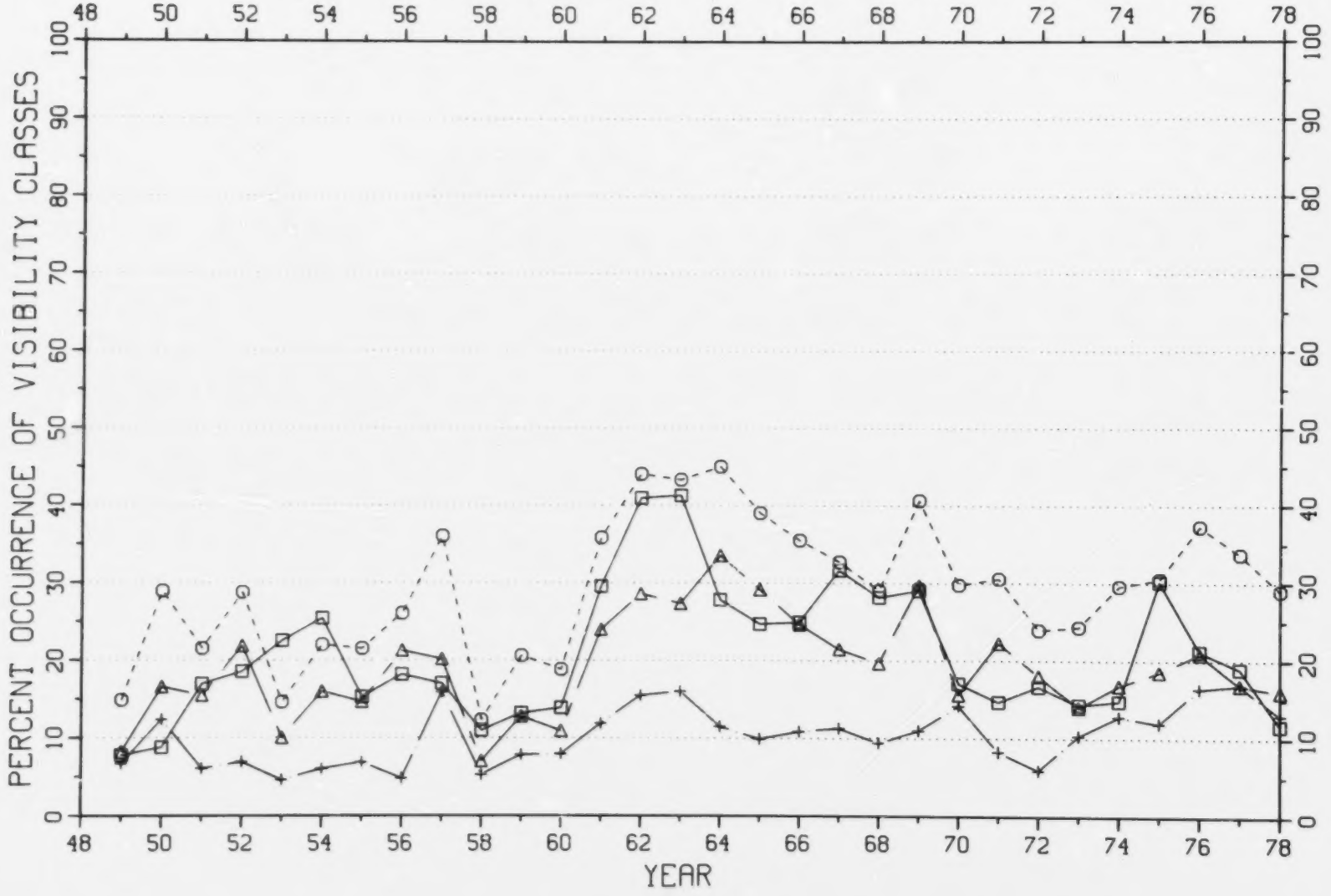

VISIBILITY TIME SERIES FOR MCG MCGRATH, AK
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 10 20 30 40 50 60 70 80 90 100

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR MCG MCGRATH, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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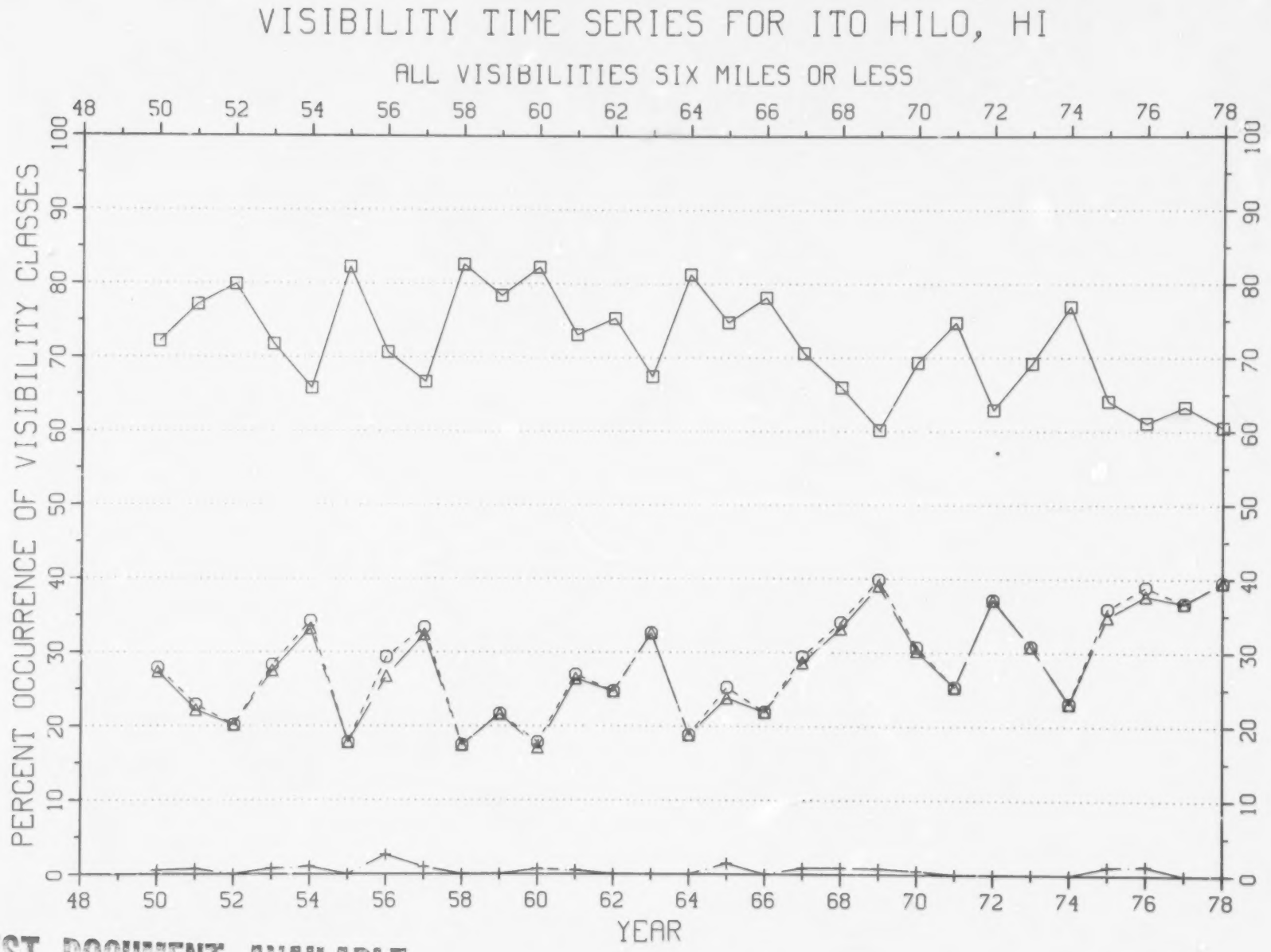

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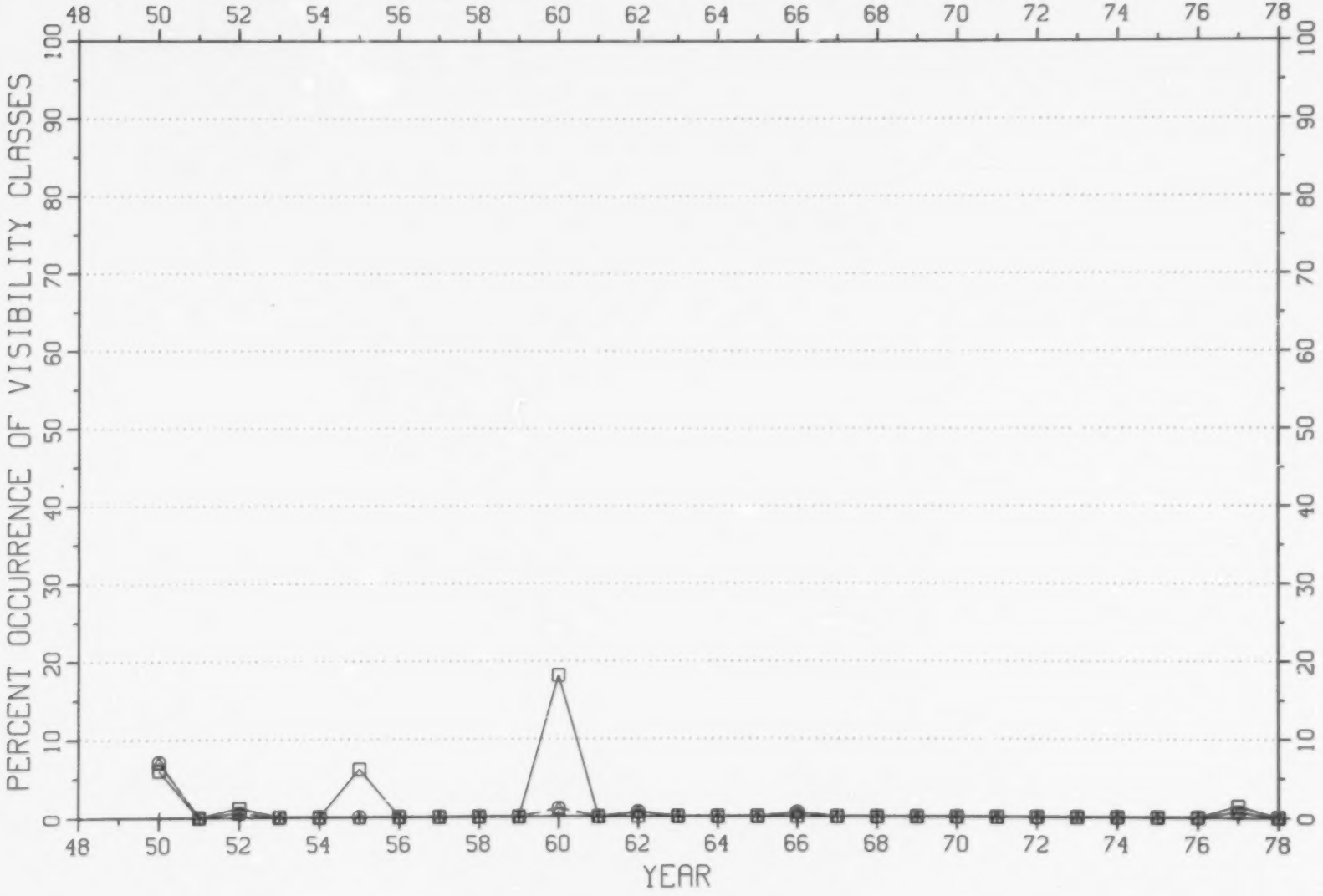
VISIBILITY TIME SERIES FOR ITO HILO, HI

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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APPENDIX B

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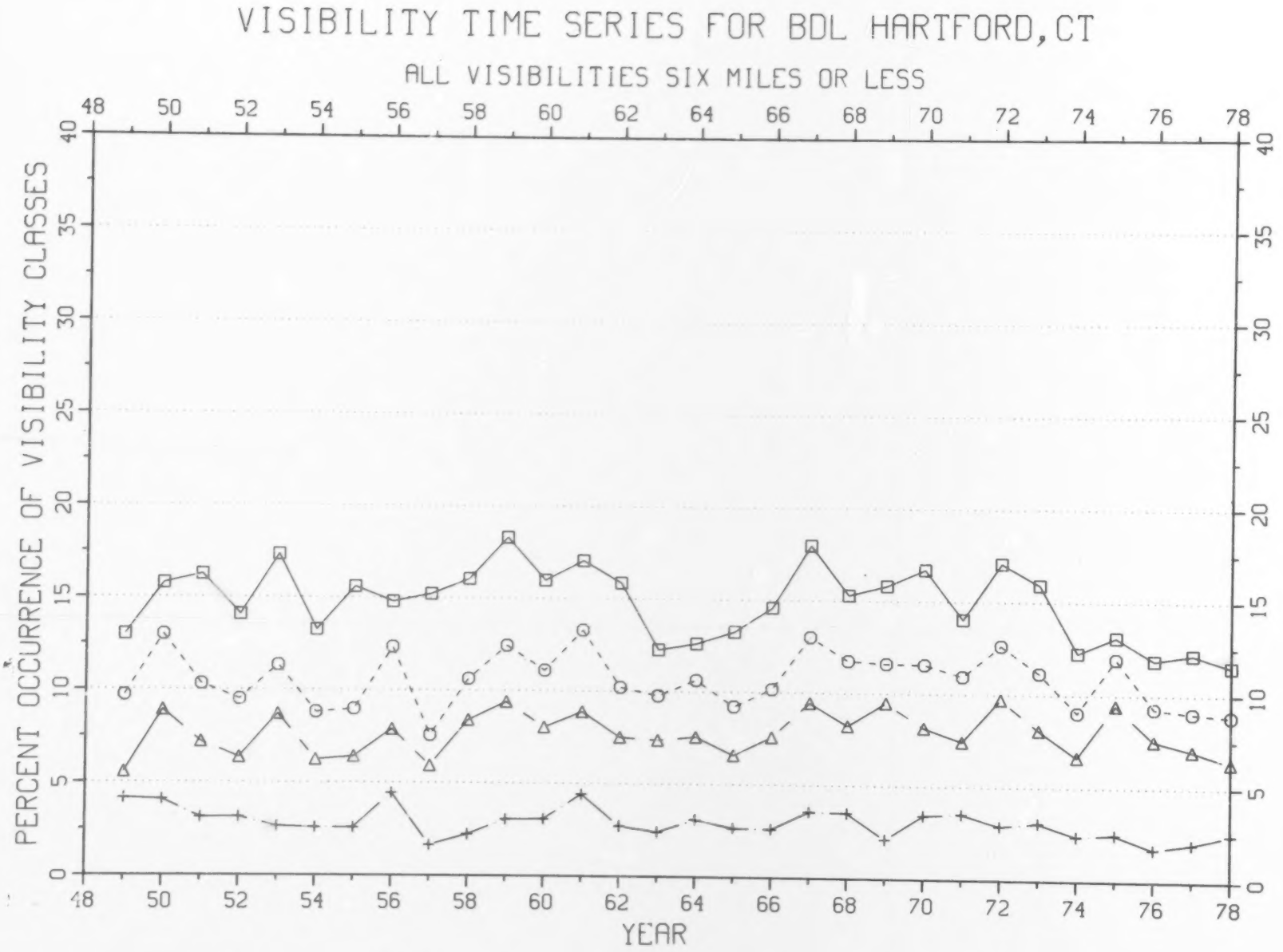

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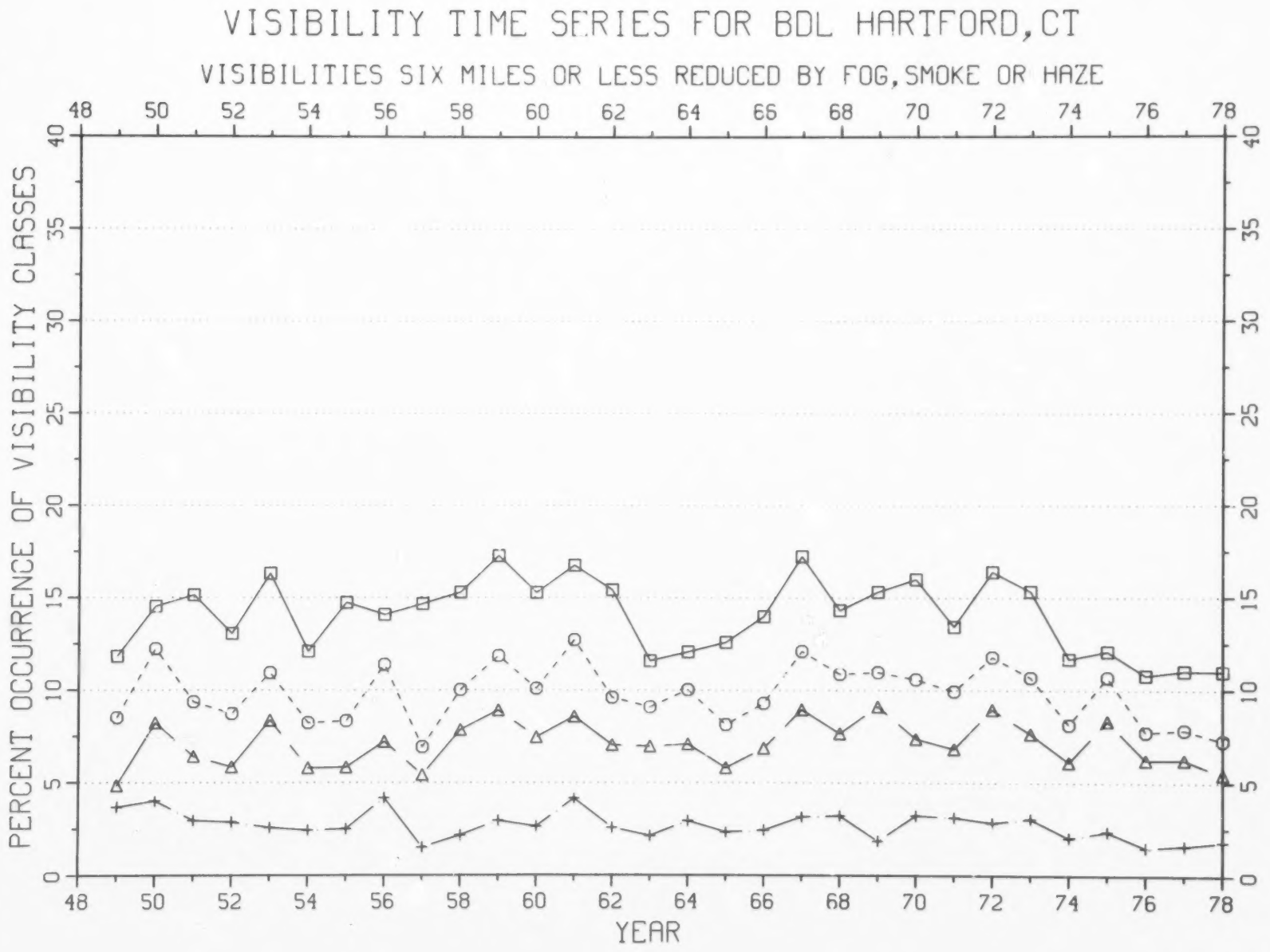

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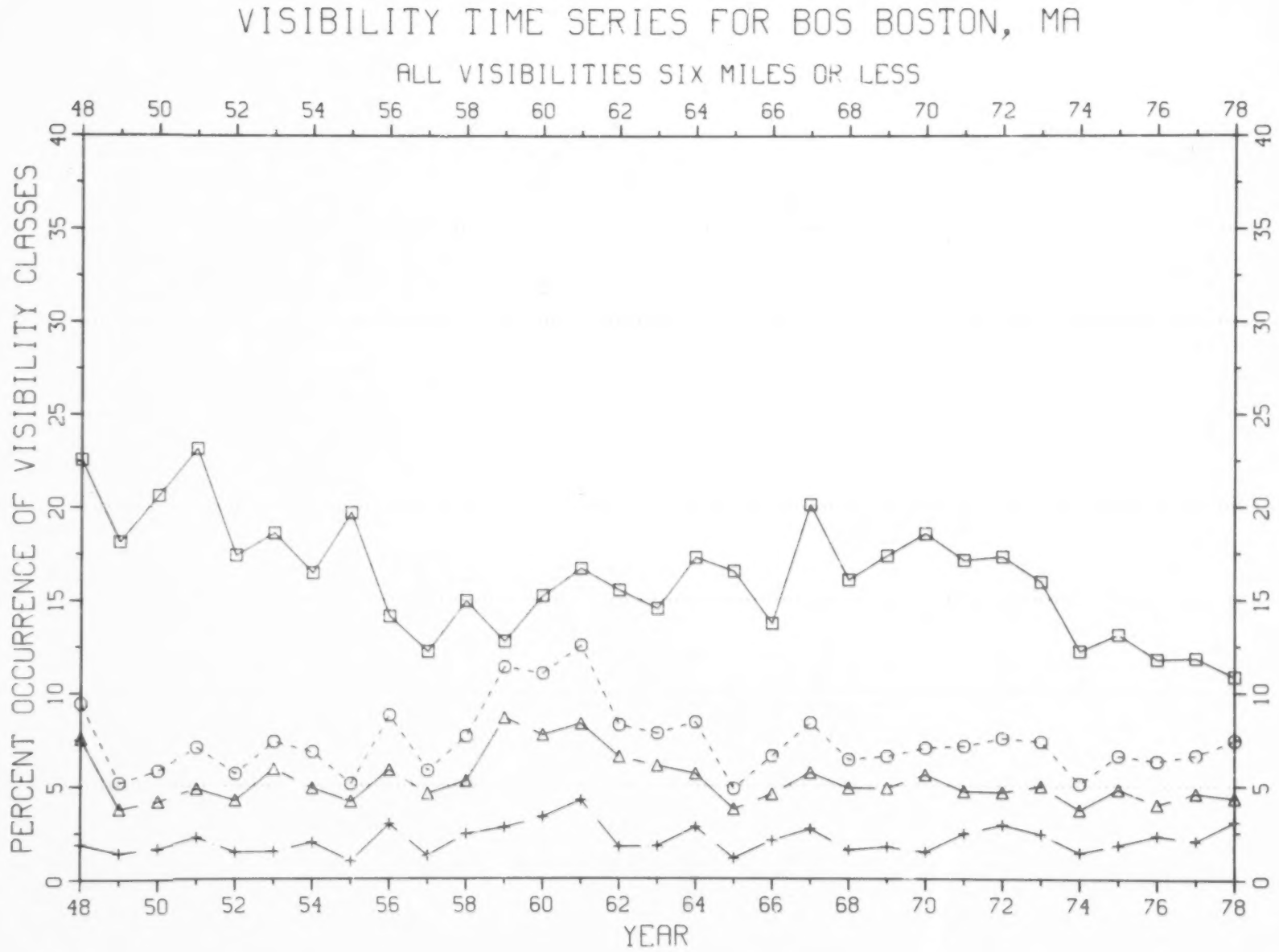
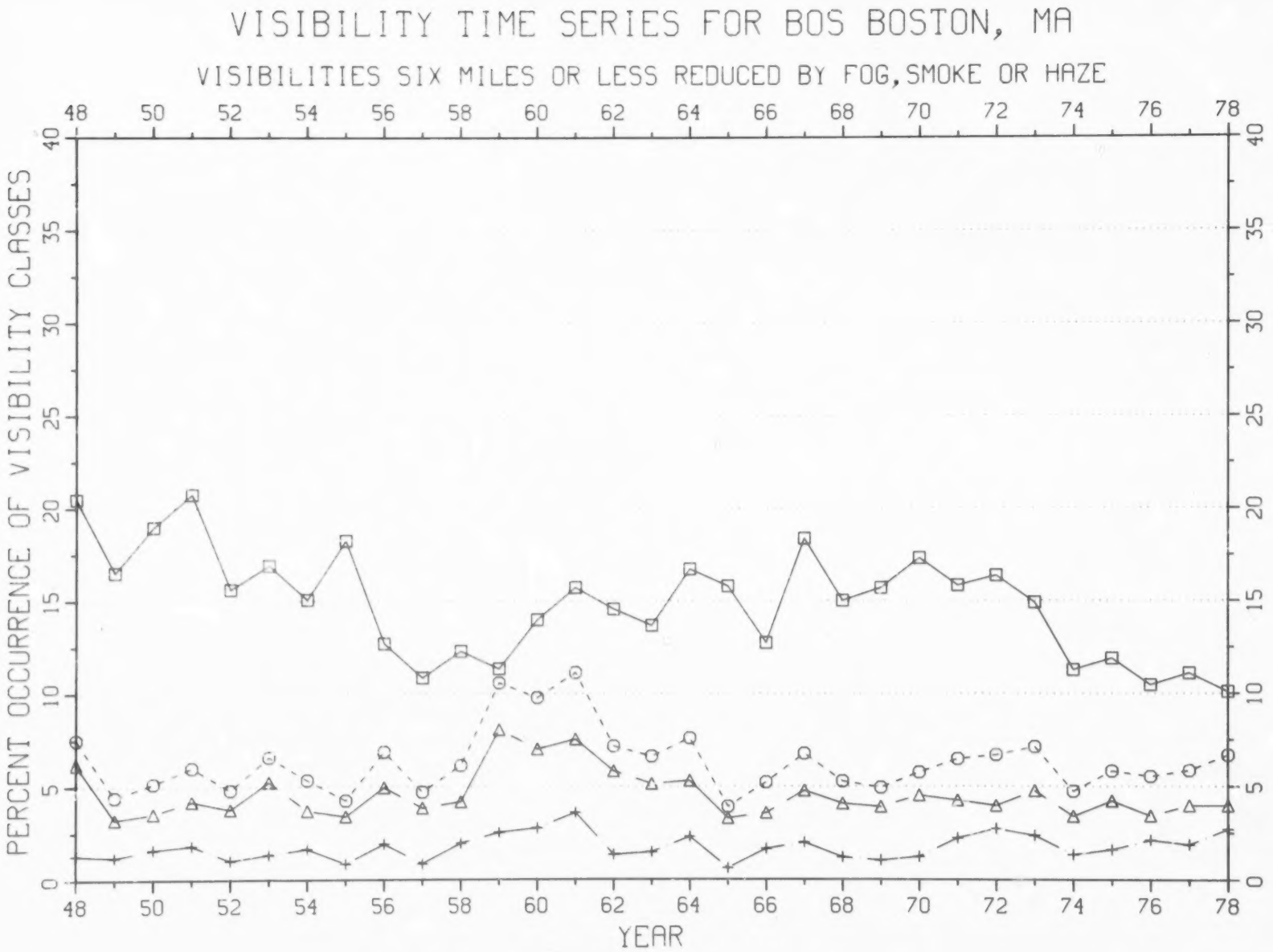
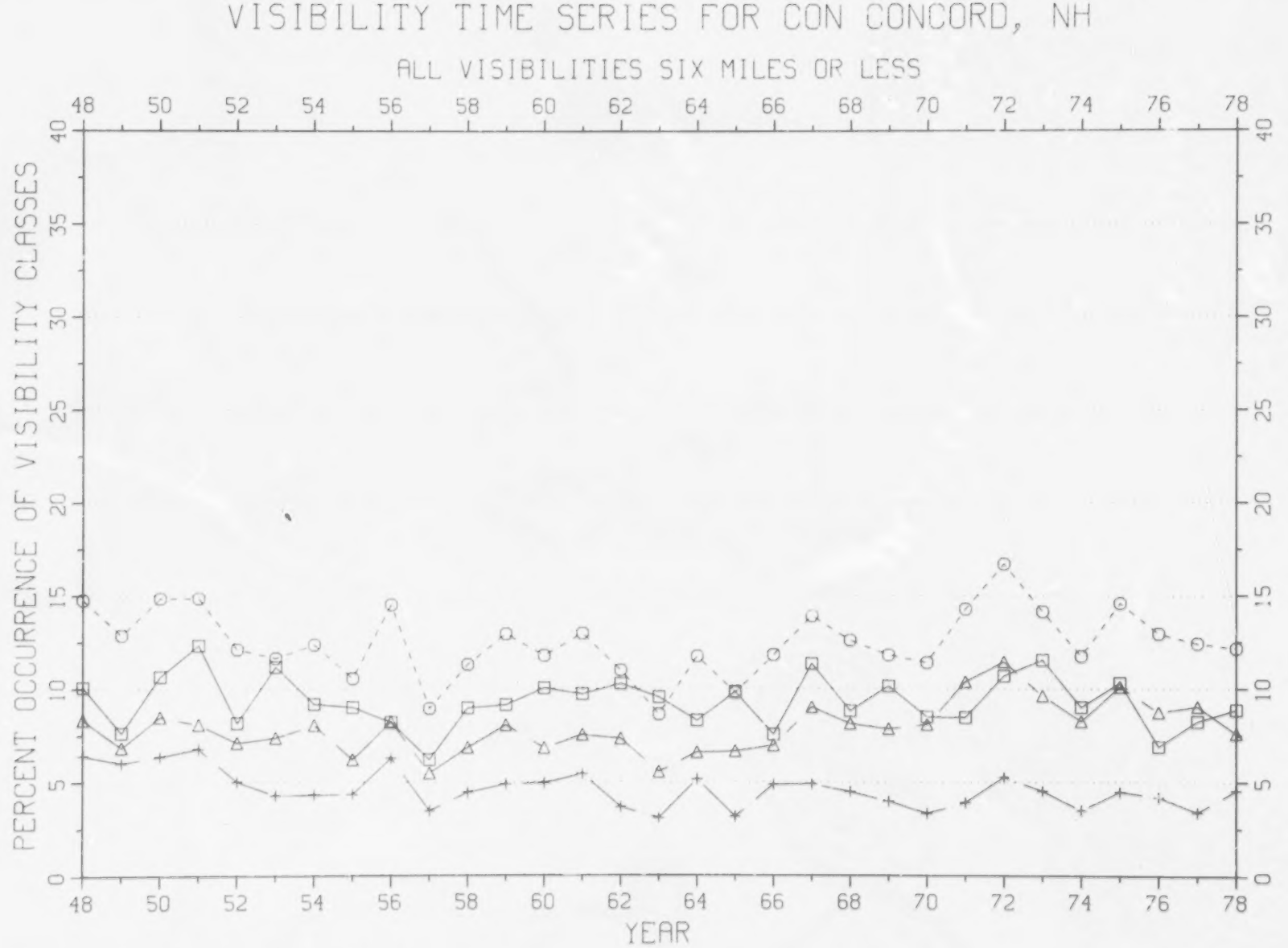

VISIBILITY TIME SERIES FOR BOS BOSTON, MA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR BOS BOSTON, MA
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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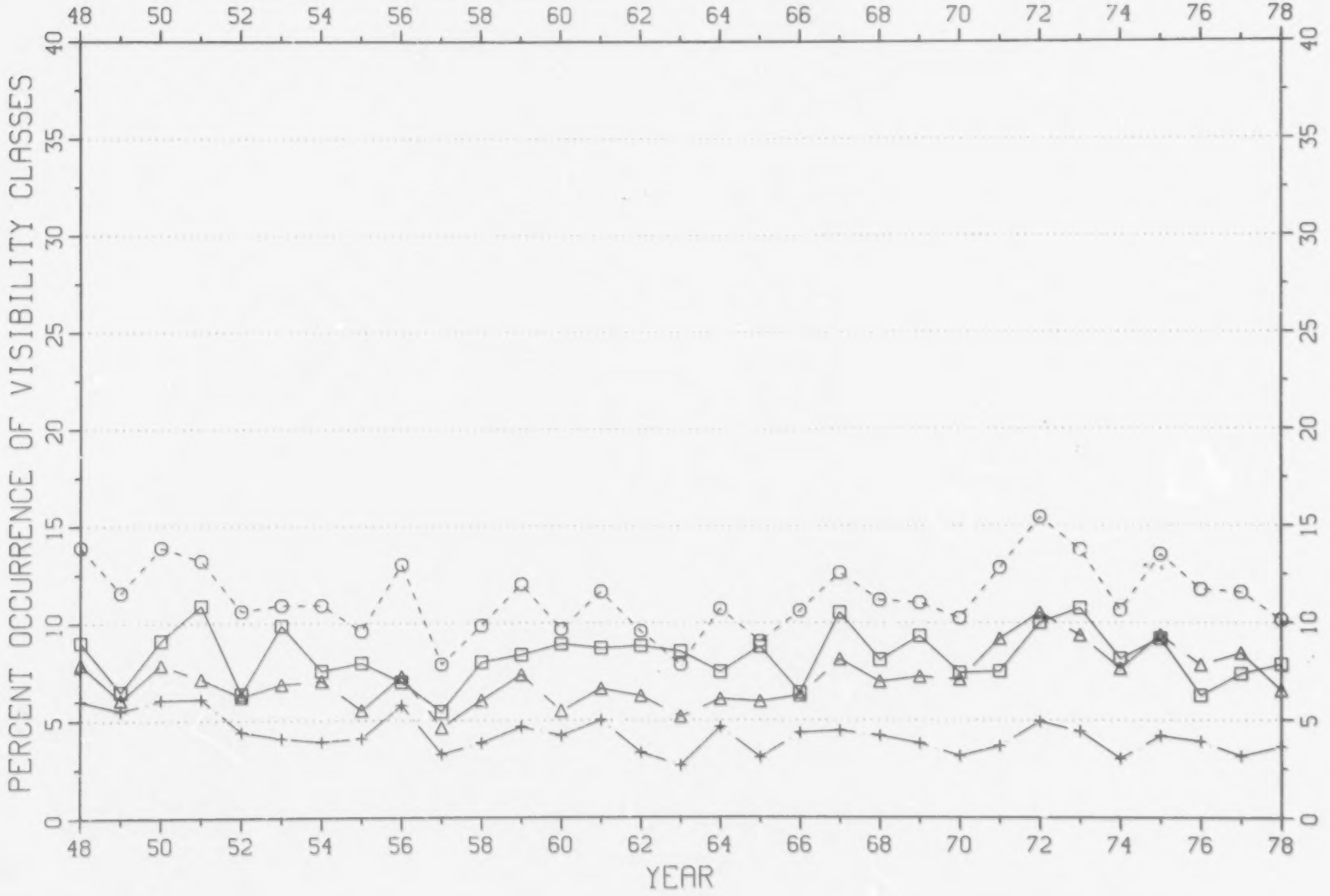
VISIBILITY TIME SERIES FOR CON CONCORD, NH

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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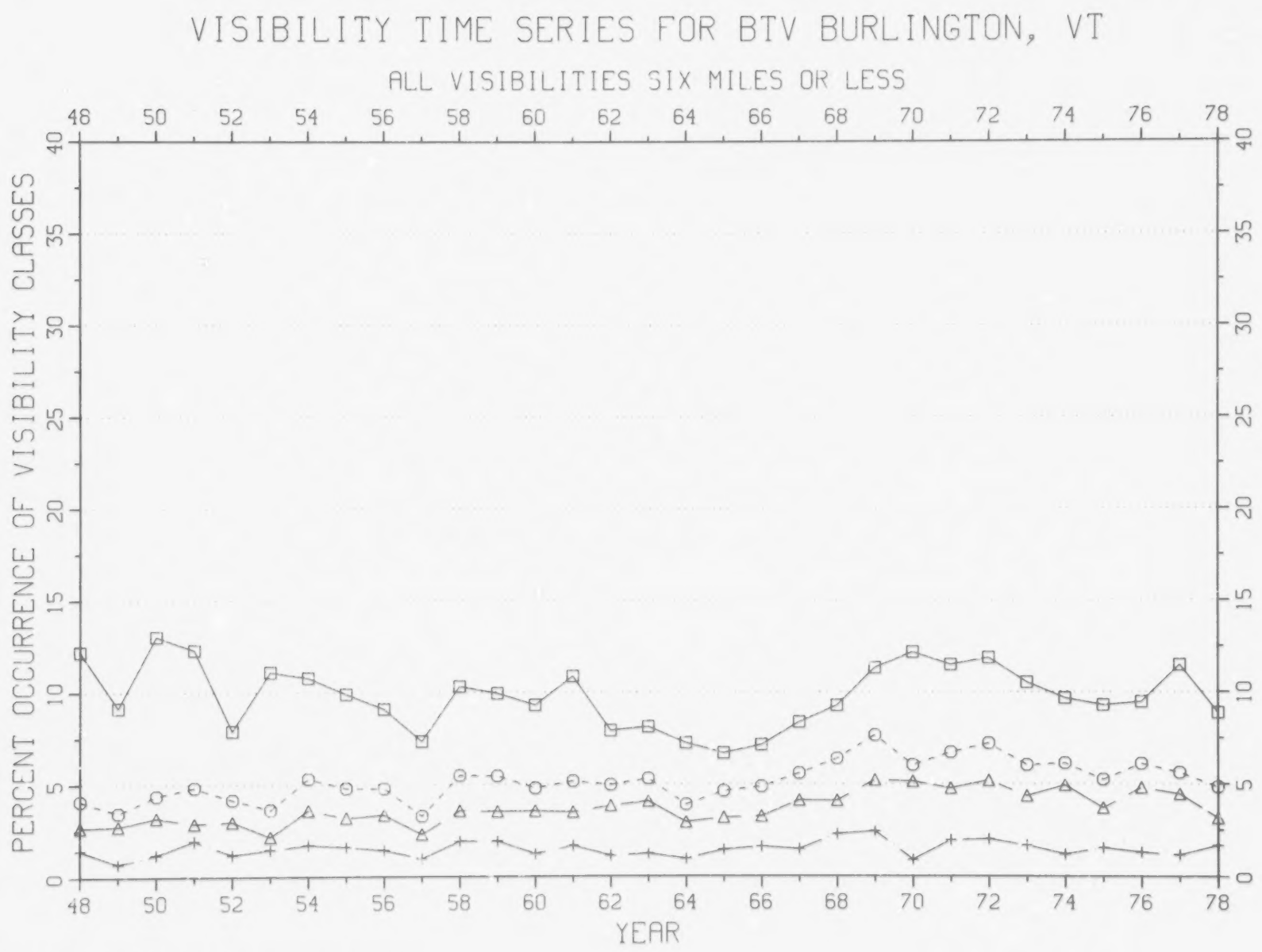

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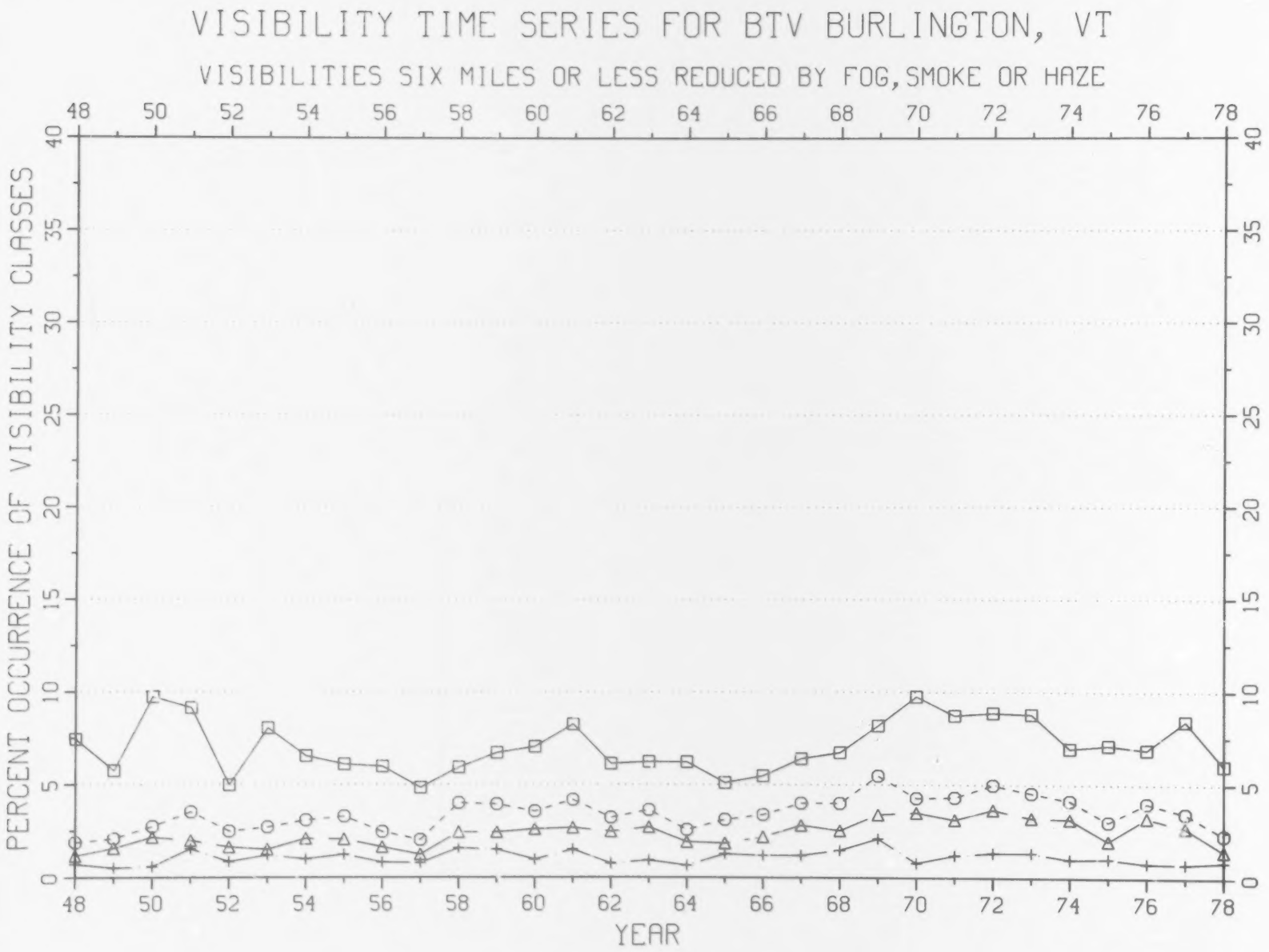
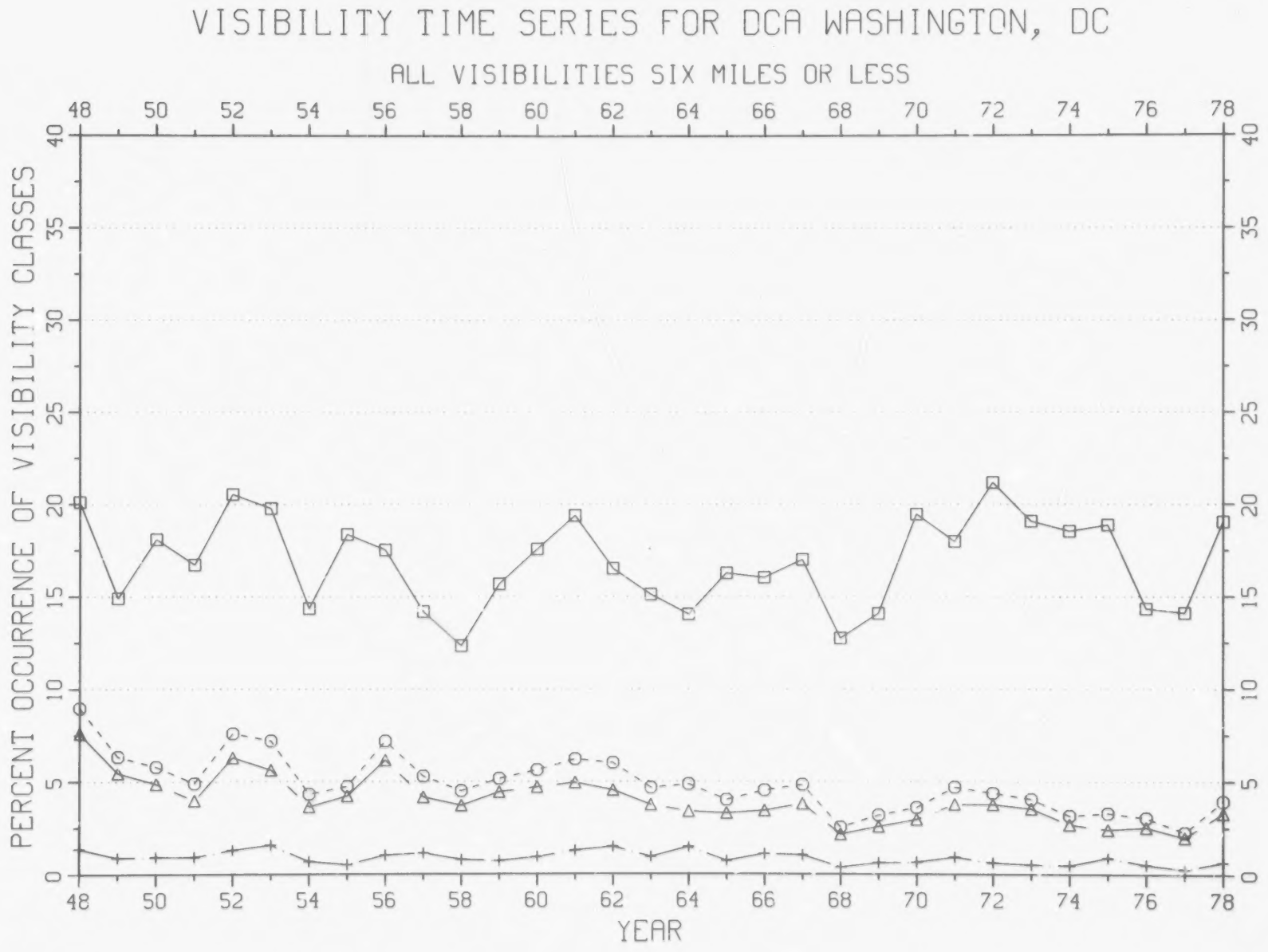

VISIBILITY TIME SERIES FOR BTV BURLINGTON, VT
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

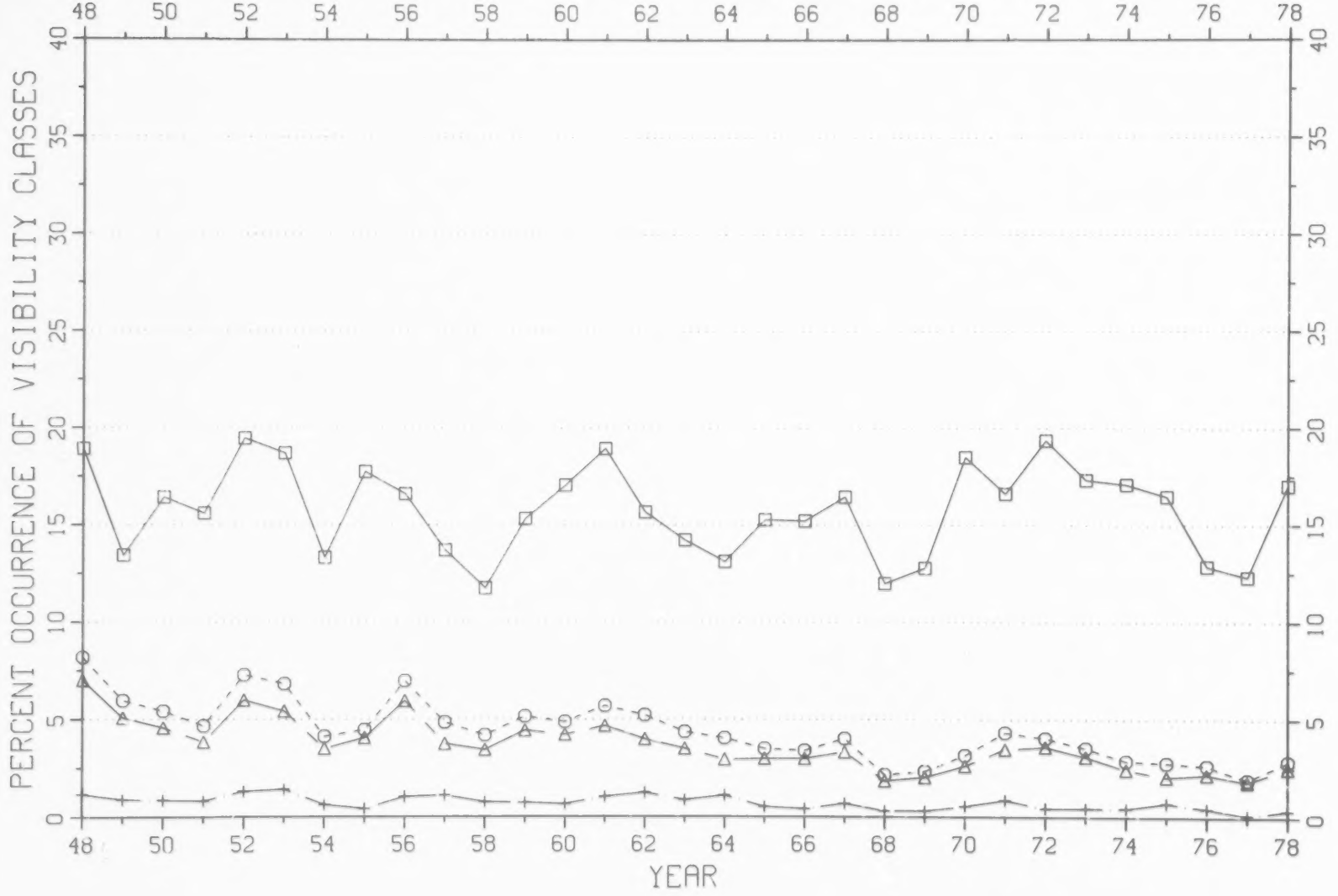
BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR DCA WASHINGTON, DC
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR DCA WASHINGTON, DC

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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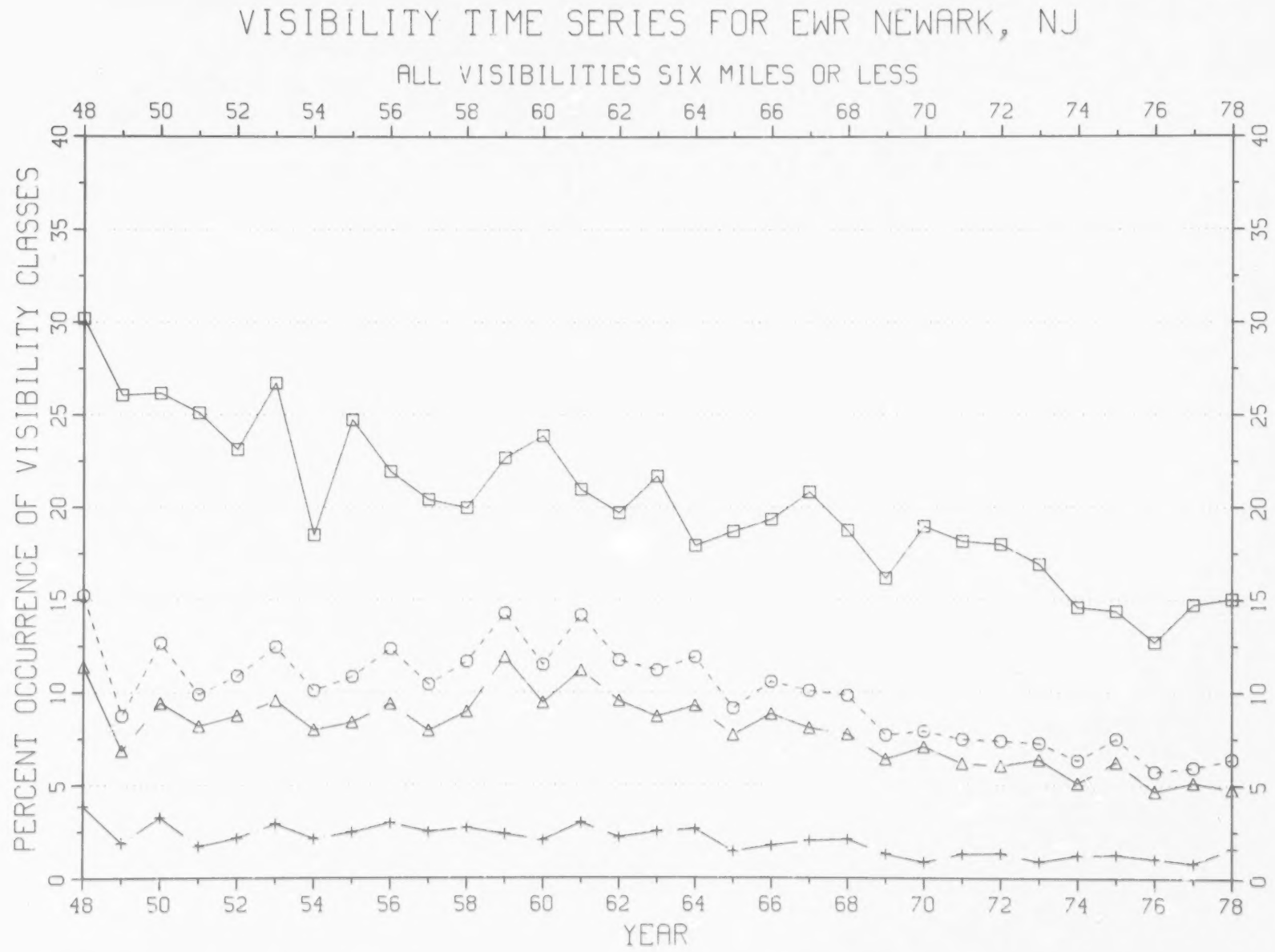

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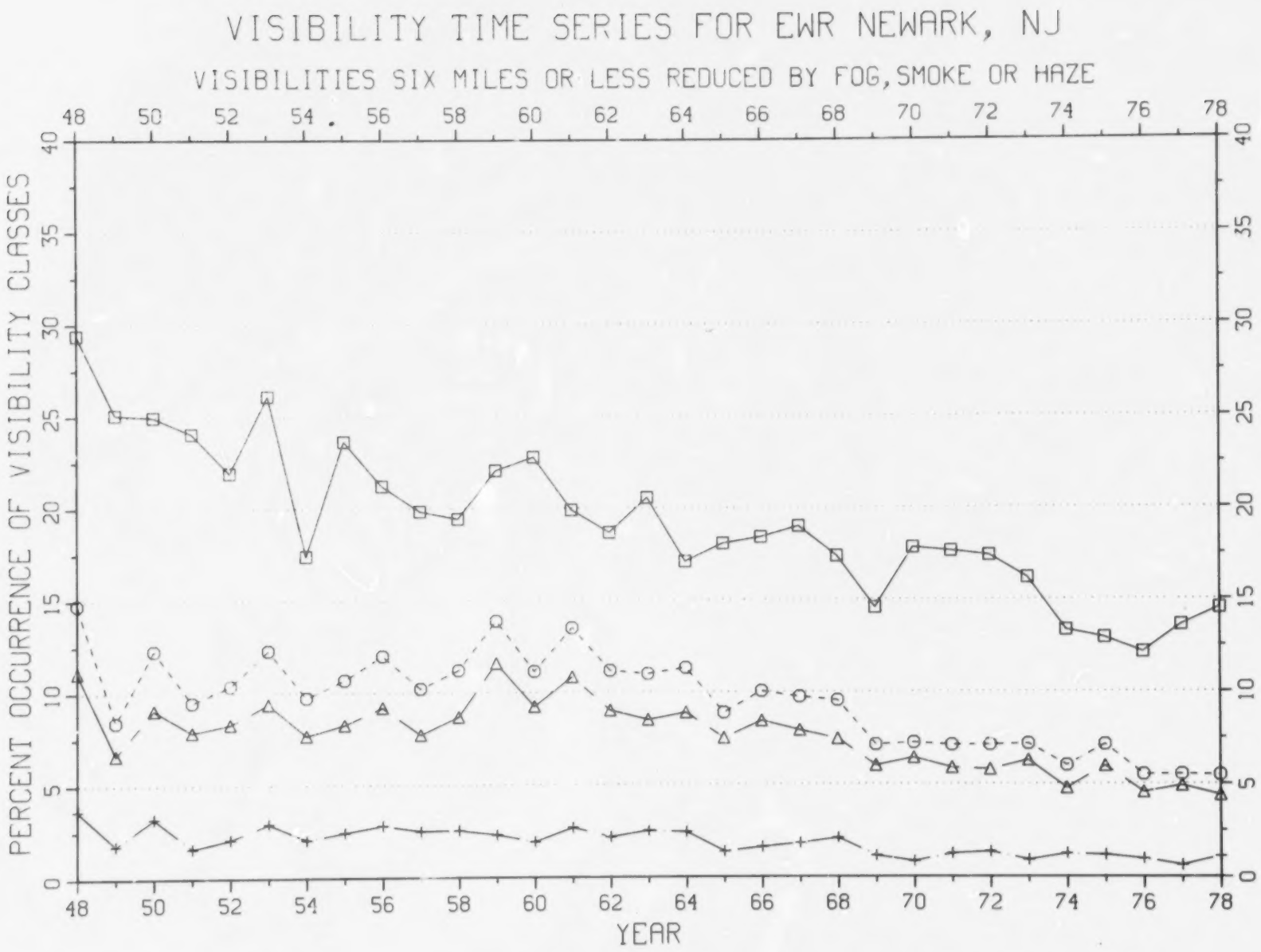
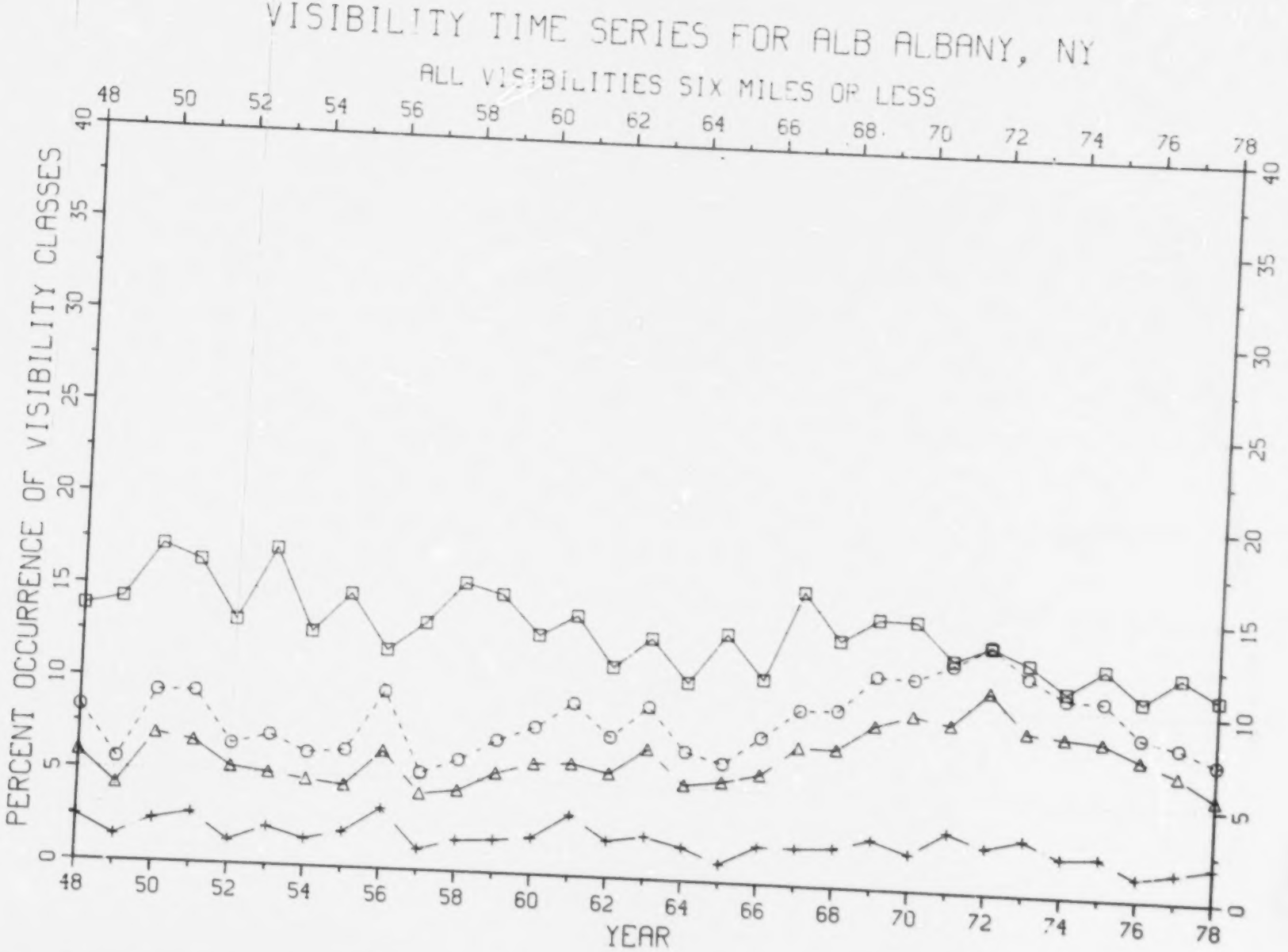

VISIBILITY TIME SERIES FOR EWR NEWARK, NJ
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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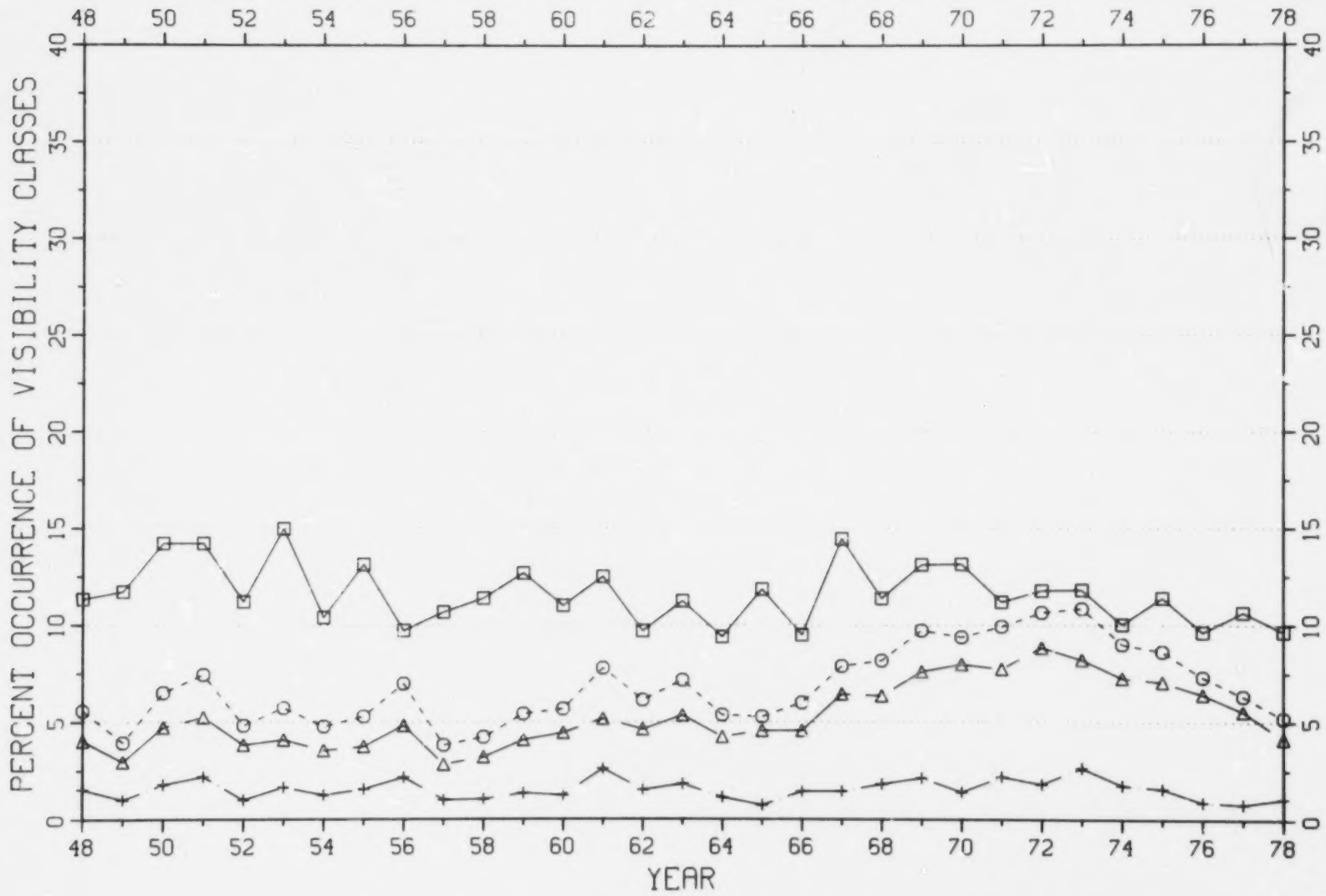
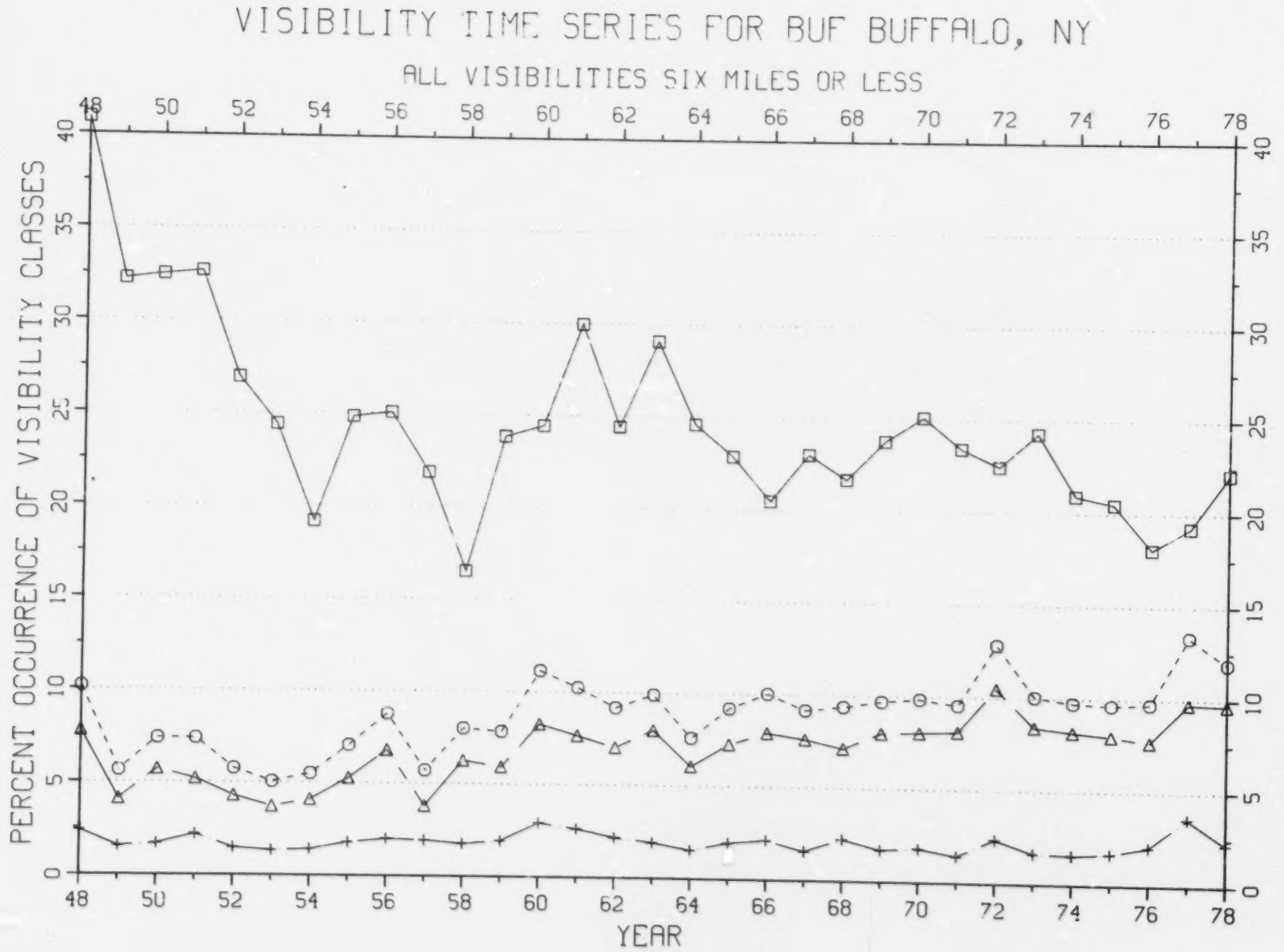

VISIBILITY TIME SERIES FOR ALB ALBANY, NY
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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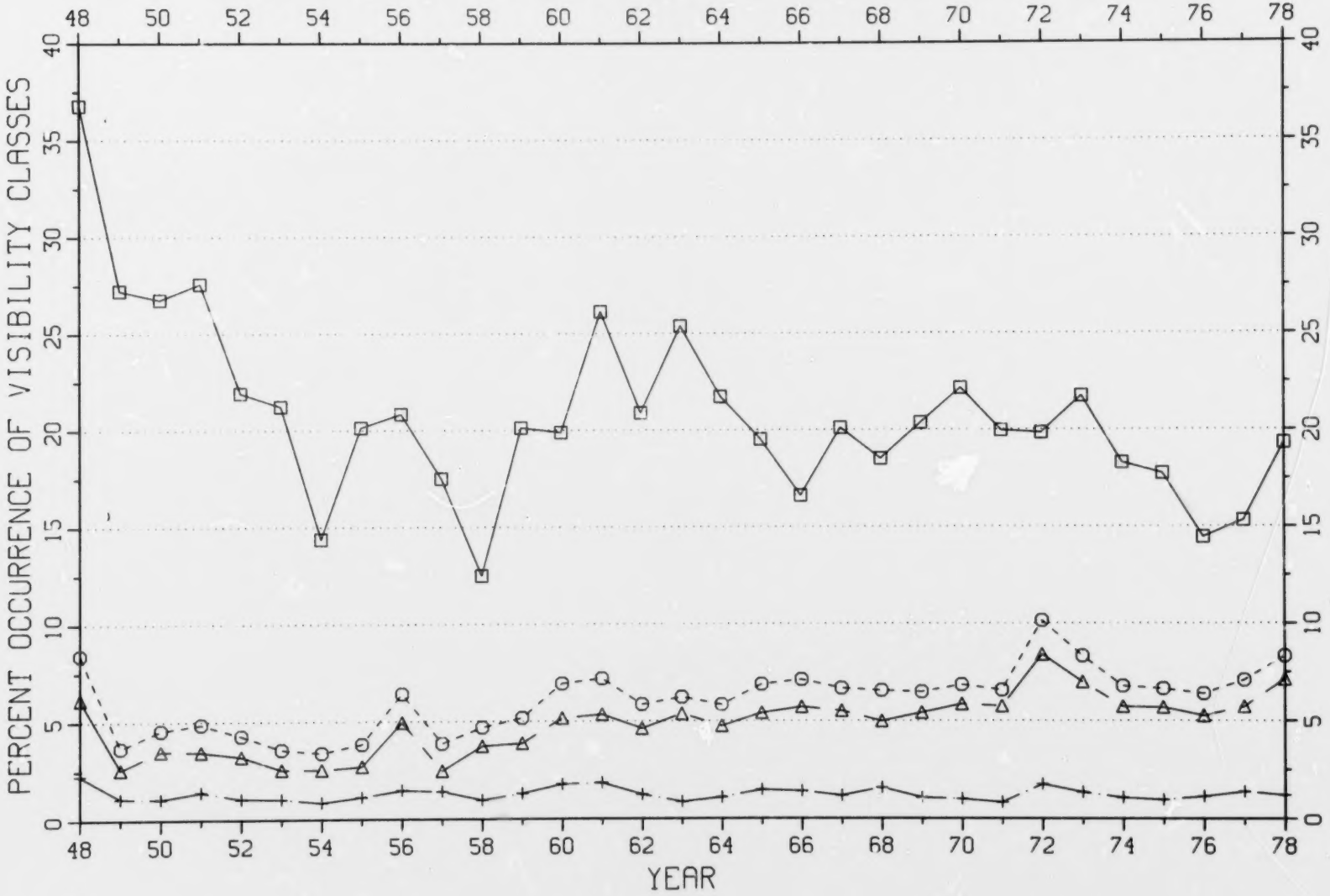
VISIBILITY TIME SERIES FOR BUF BUFFALO, NY

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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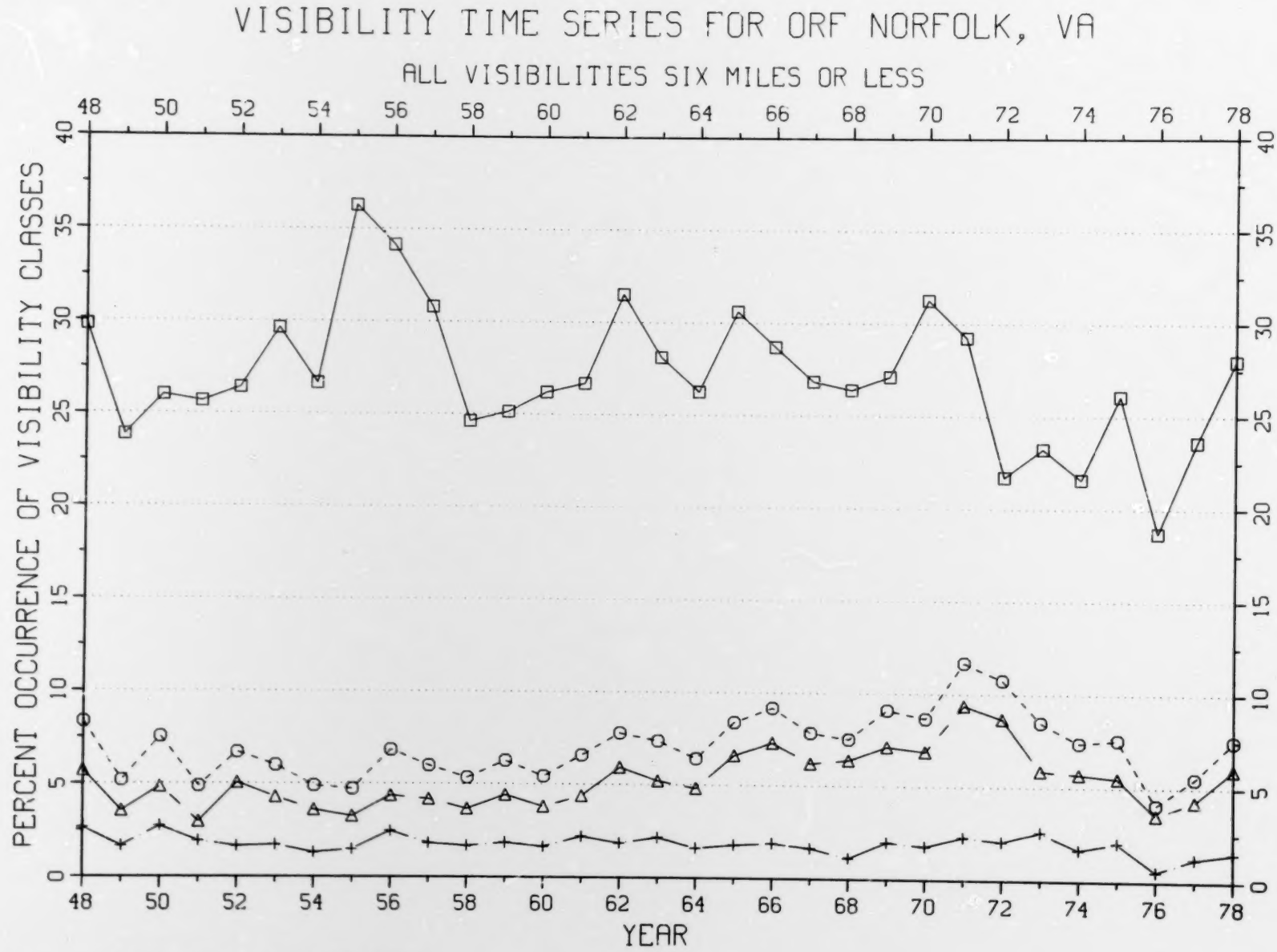
VISIBILITY TIME SERIES FOR ORF NORFOLK, VA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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0 5 10 15 20 25 30 35 40

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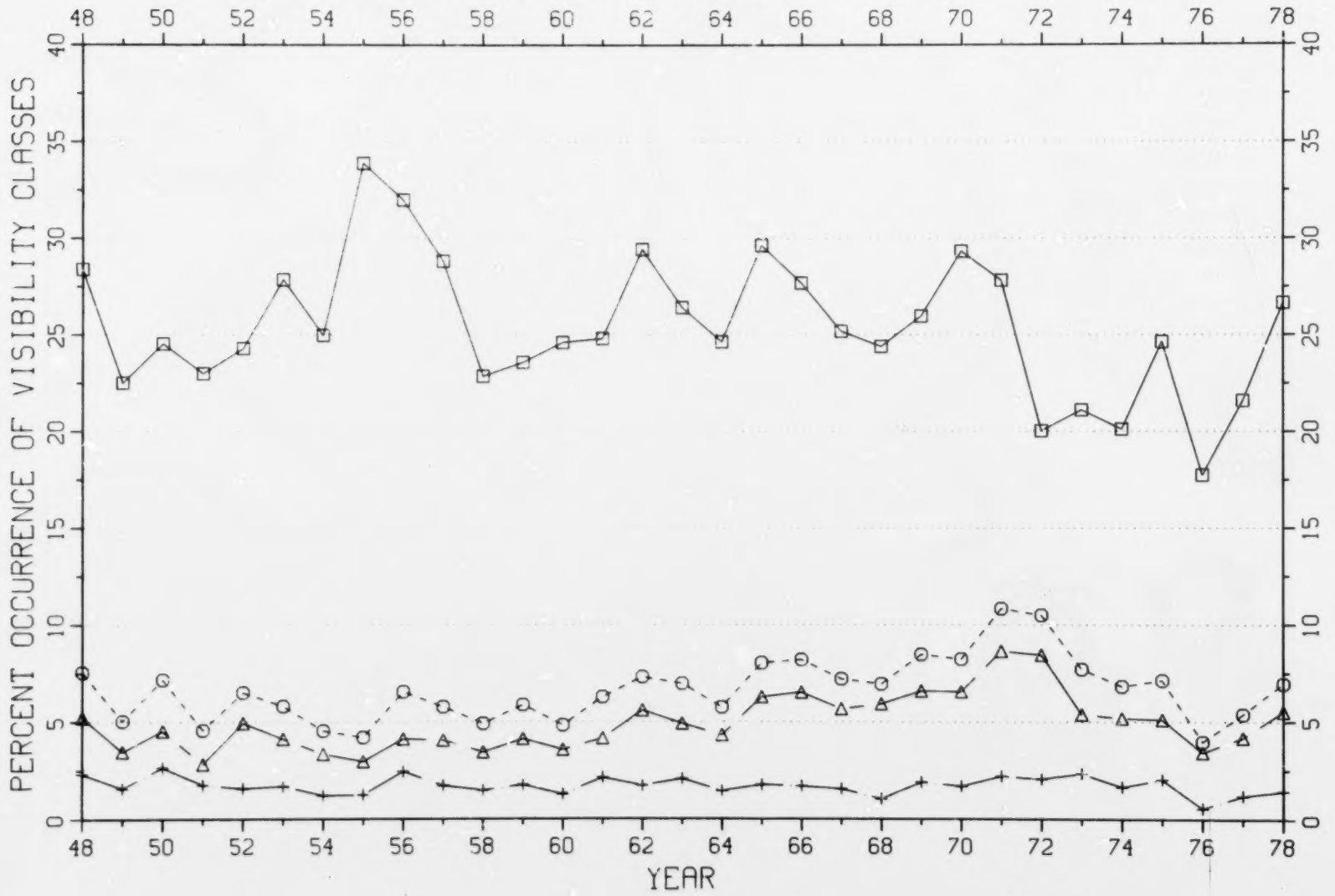

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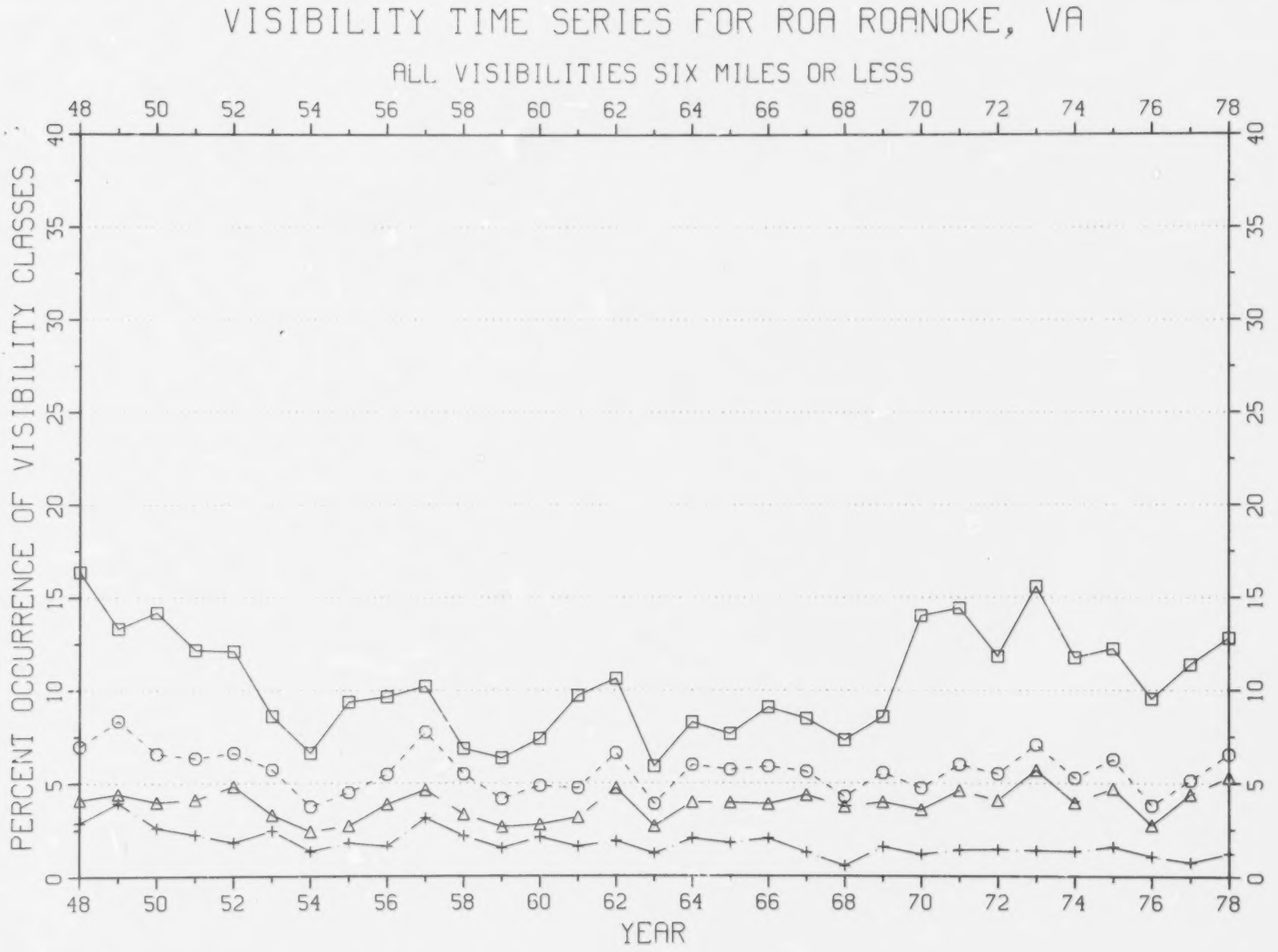
VISIBILITY TIME SERIES FOR ROA ROANOKE, VA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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0 5 10 15 20 25 30 35 40

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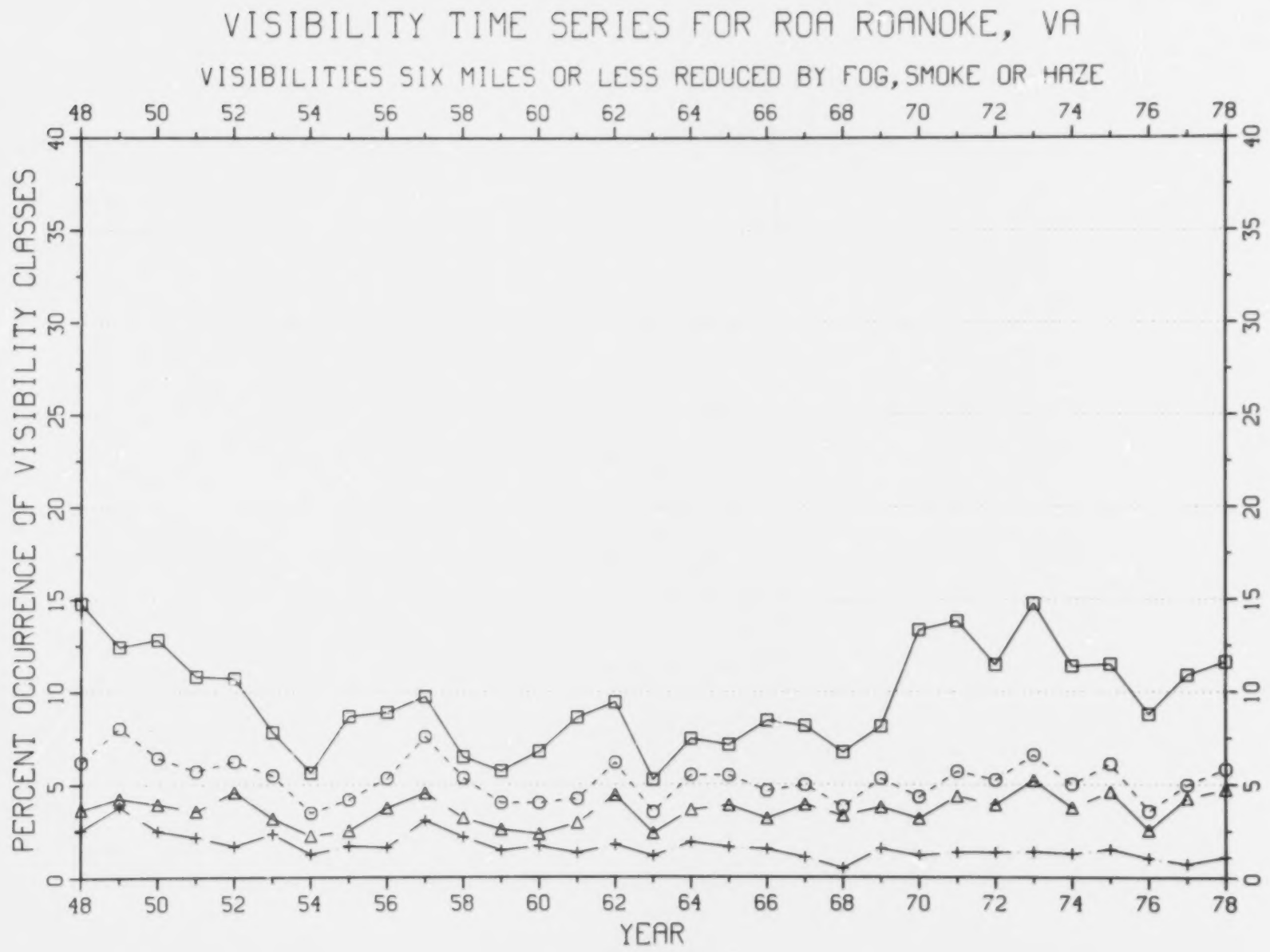

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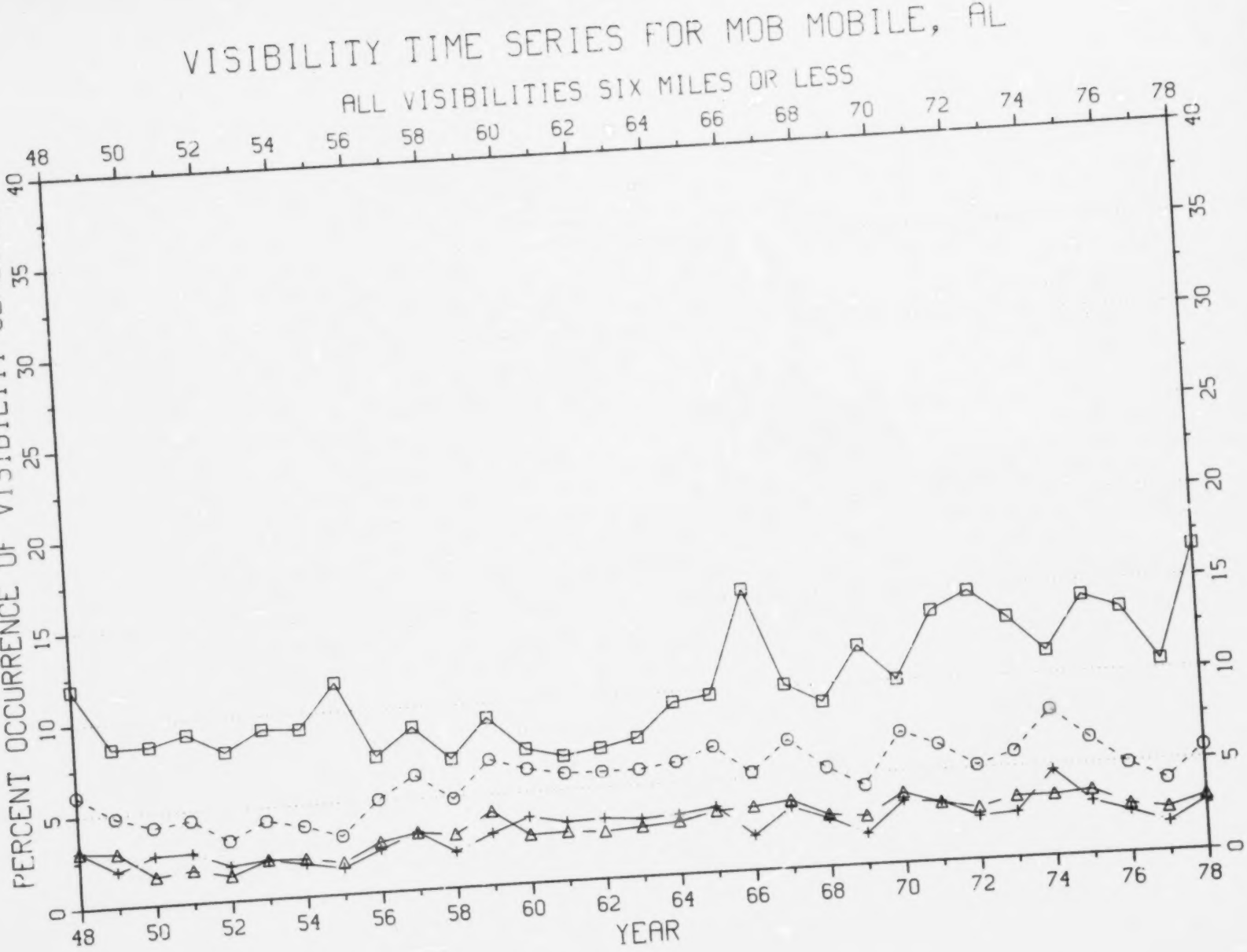

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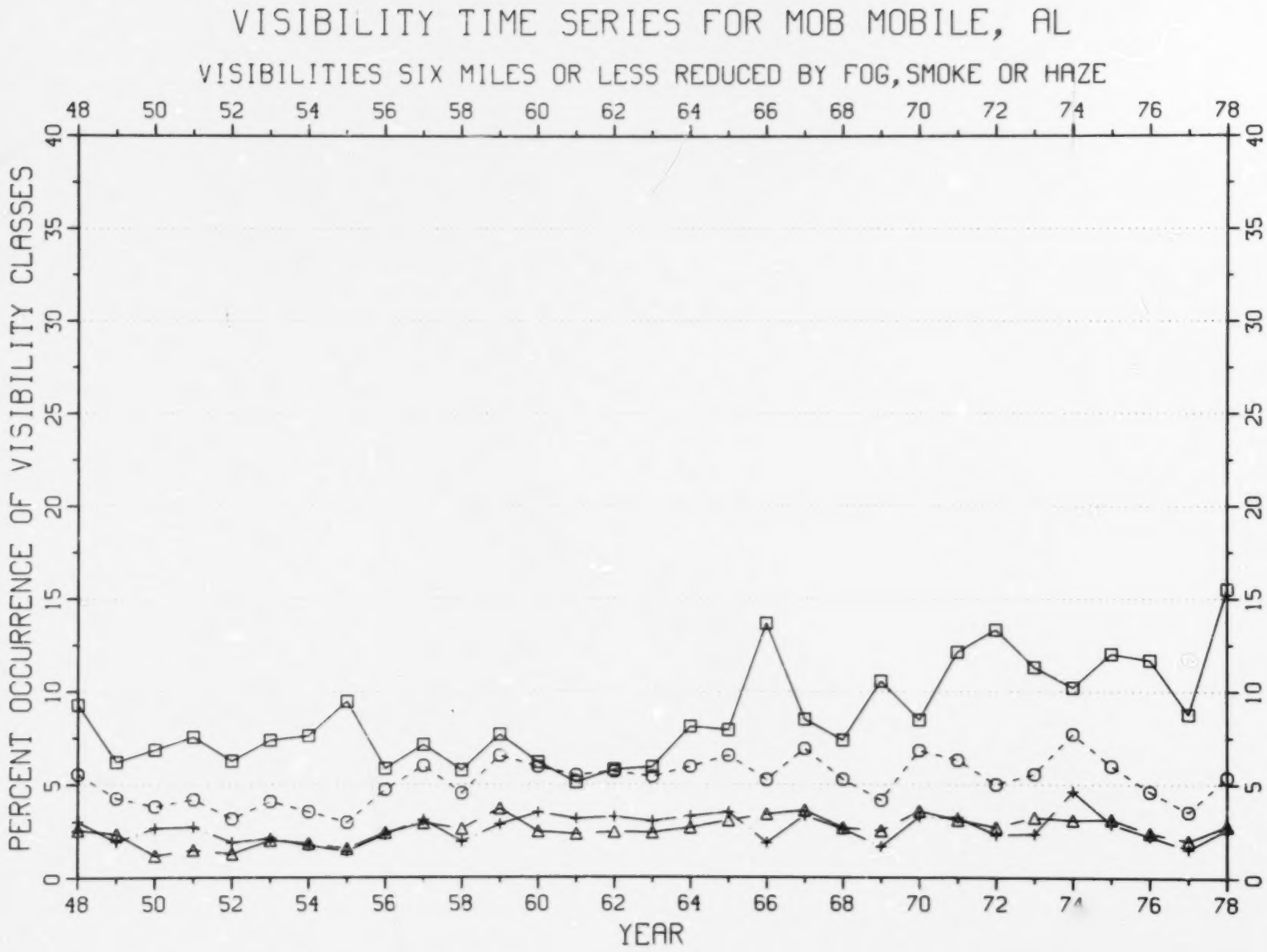
VISIBILITY TIME SERIES FOR MOB MOBILE, AL
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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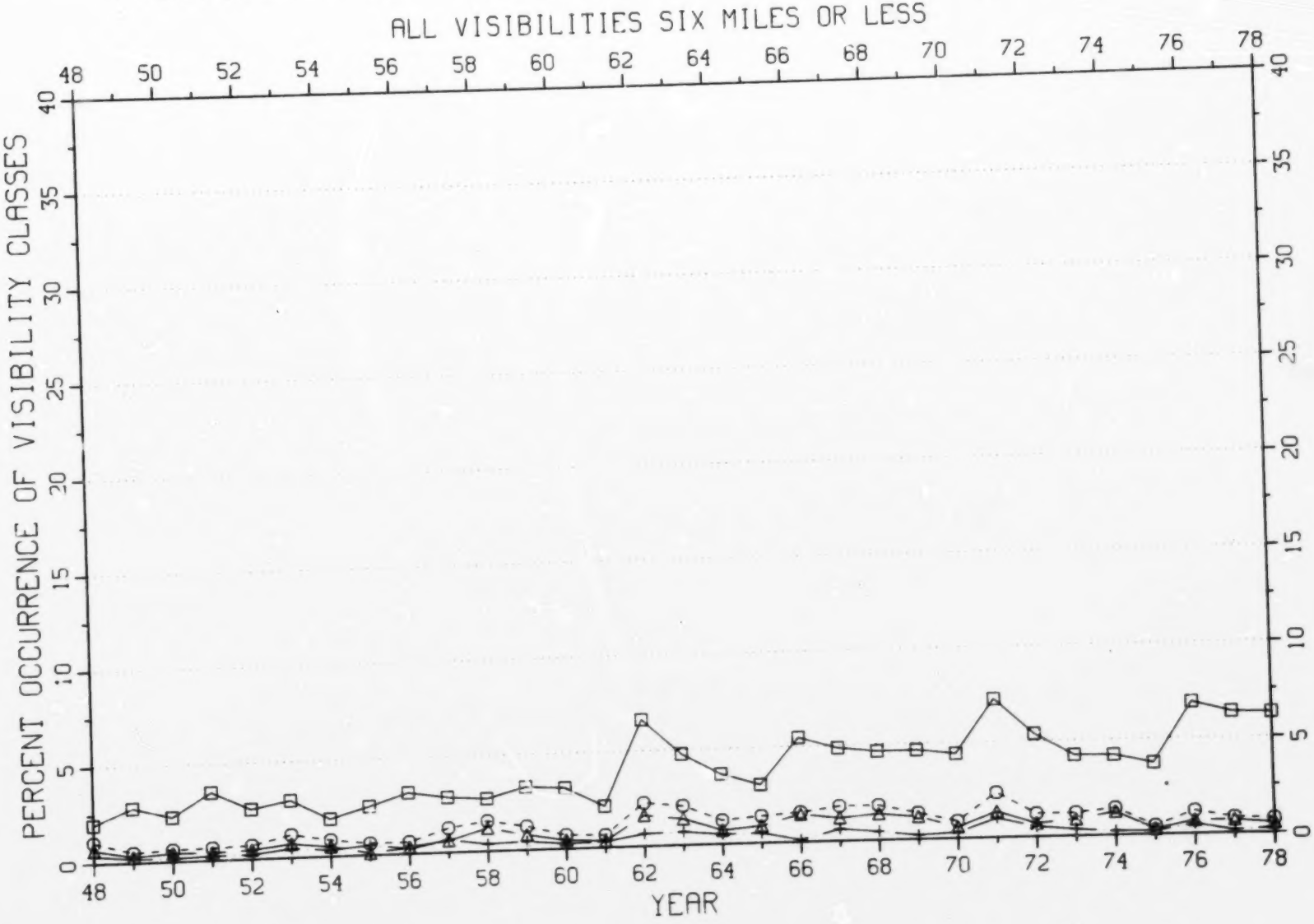
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR PBI WEST PALM BEACH, FL



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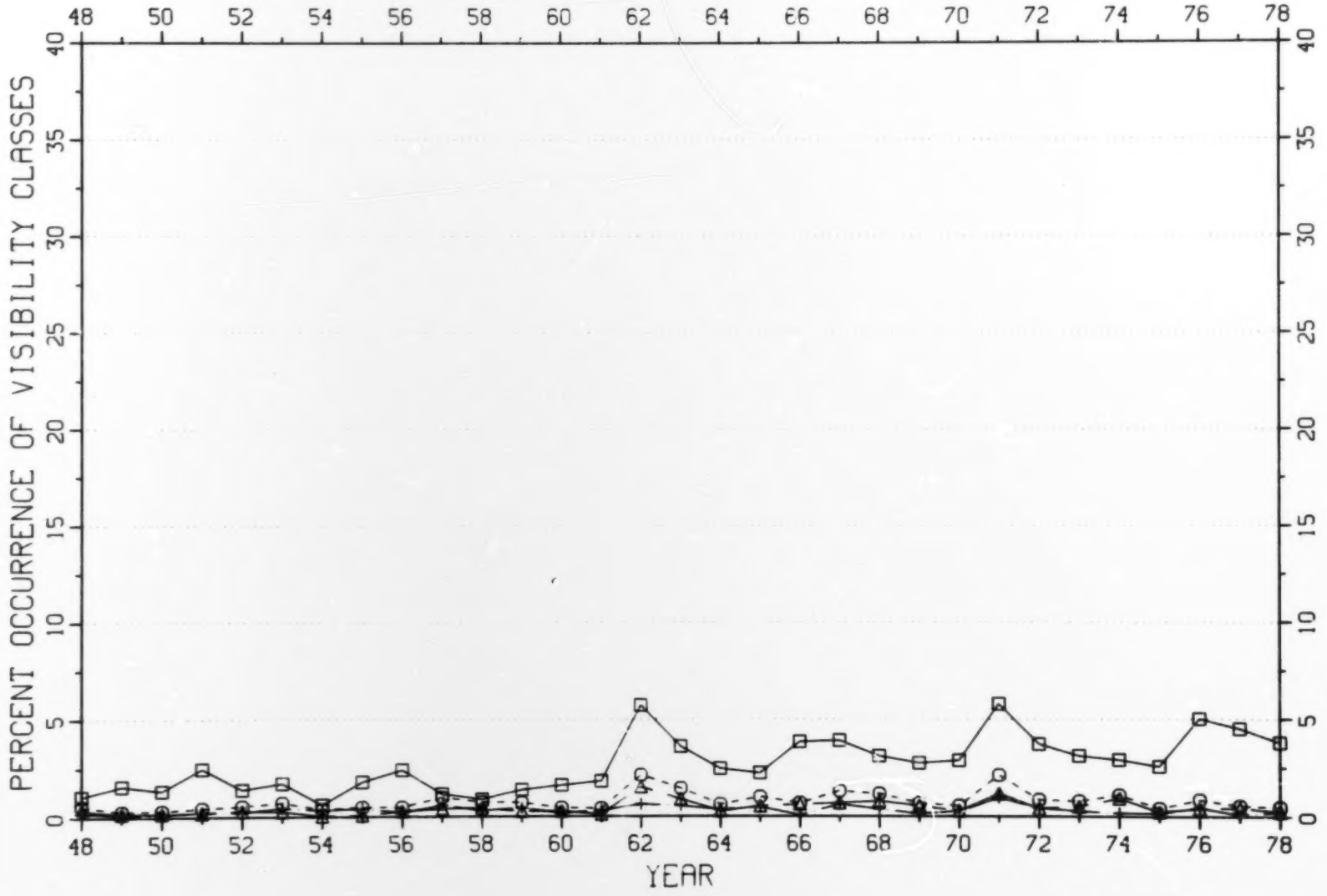
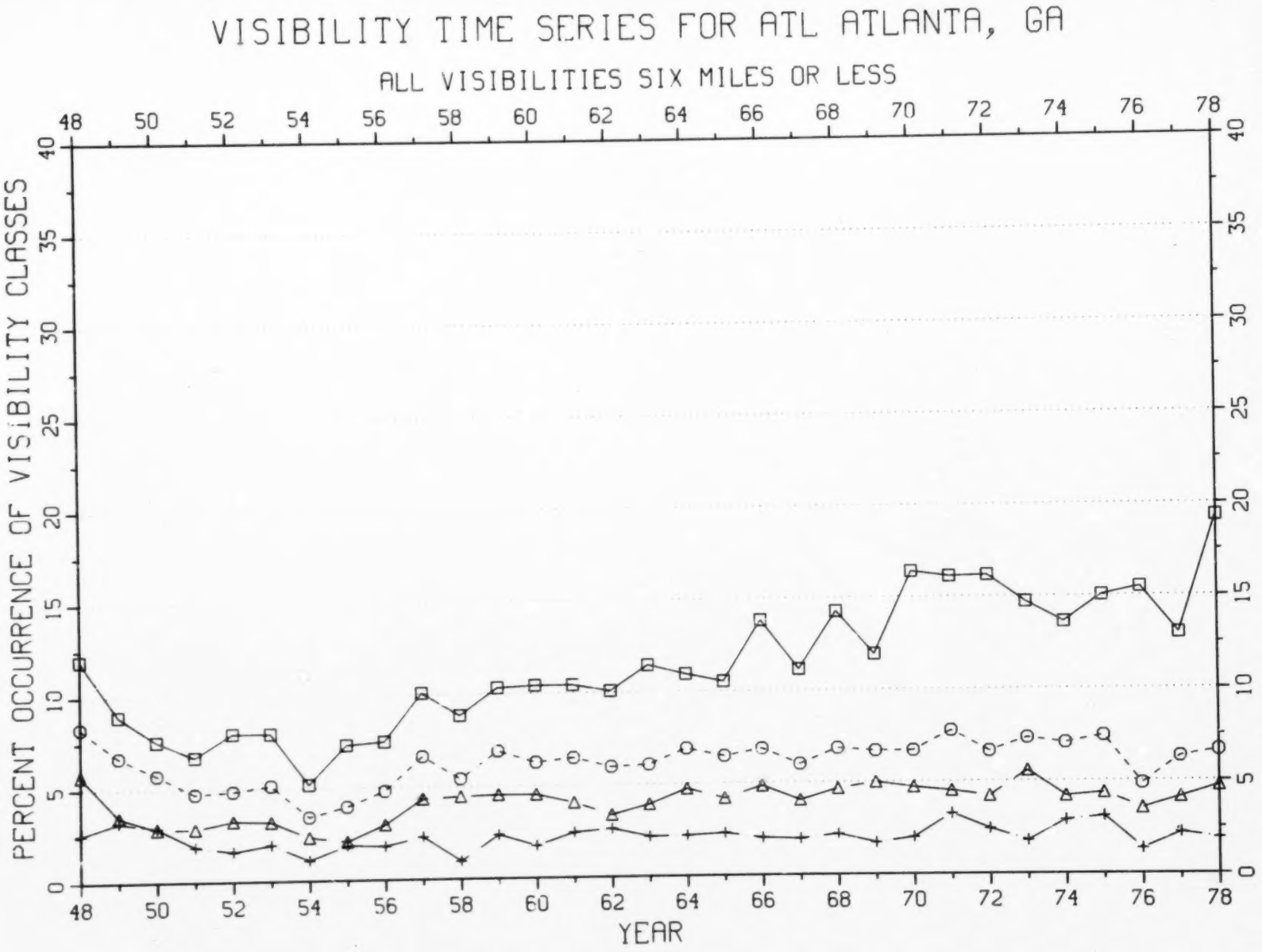

VISIBILITY TIME SERIES FOR PBI WEST PALM BEACH, FL
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR ATL ATLANTA, GA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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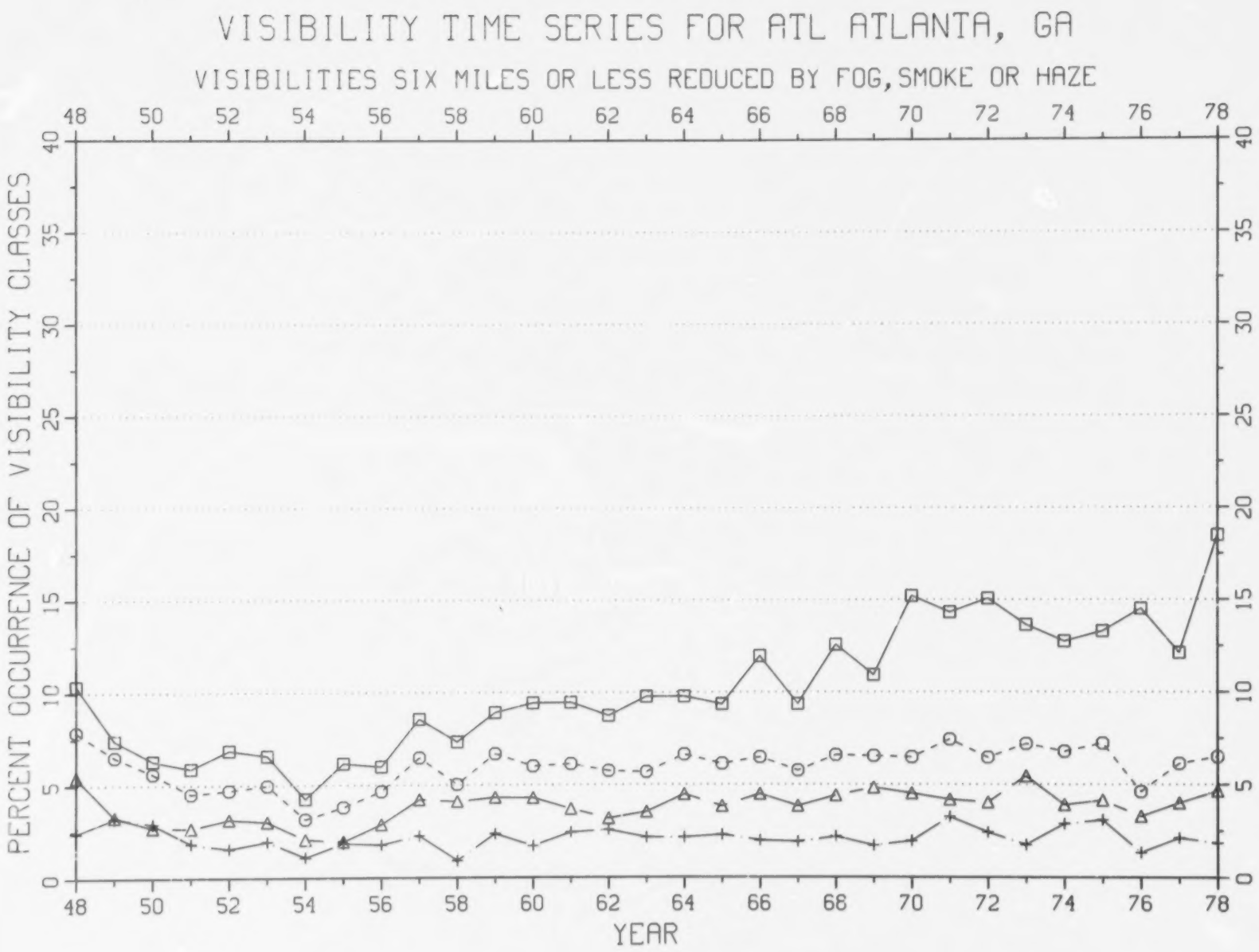
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR ATL ATLANTA, GA
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
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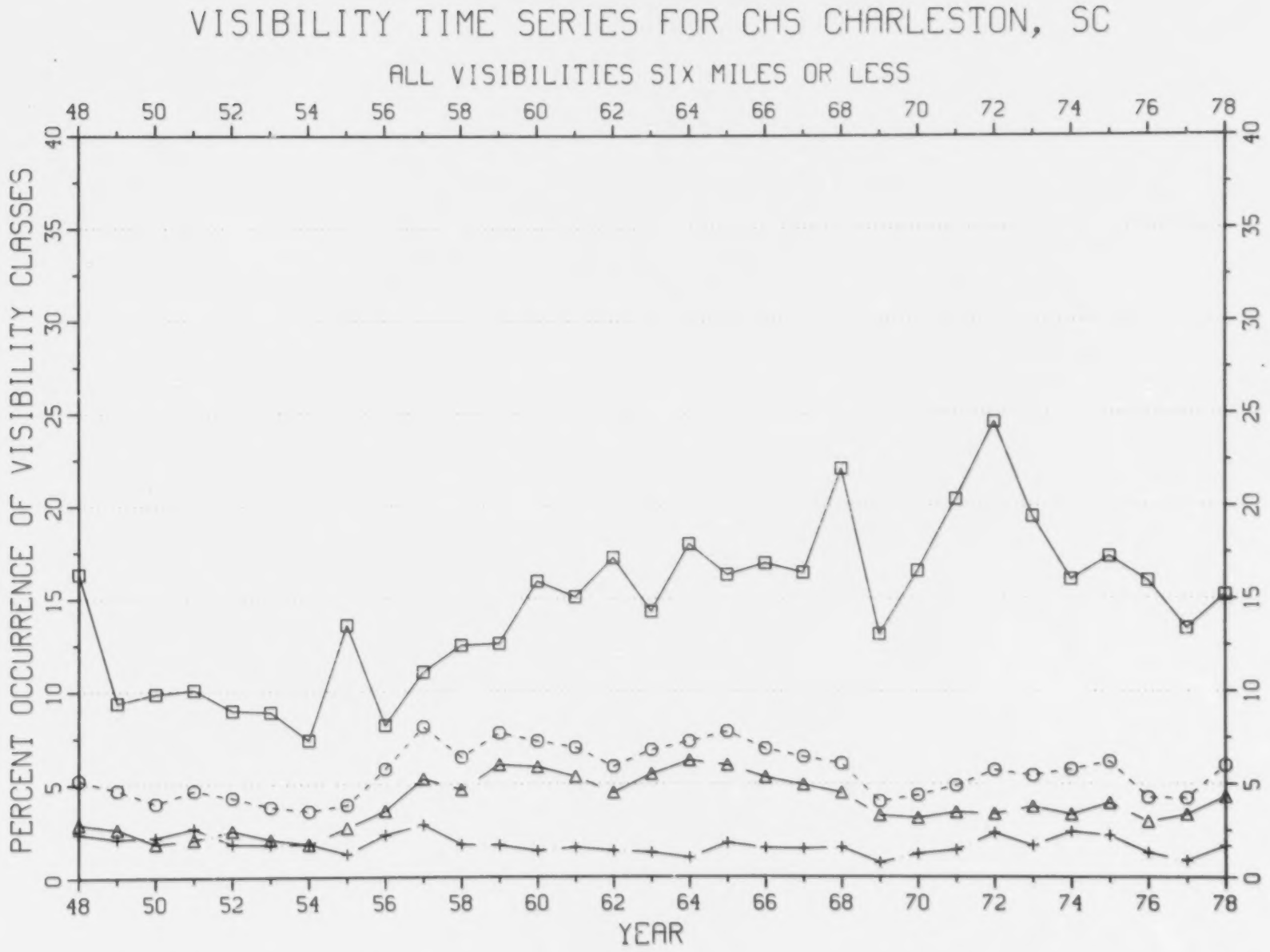
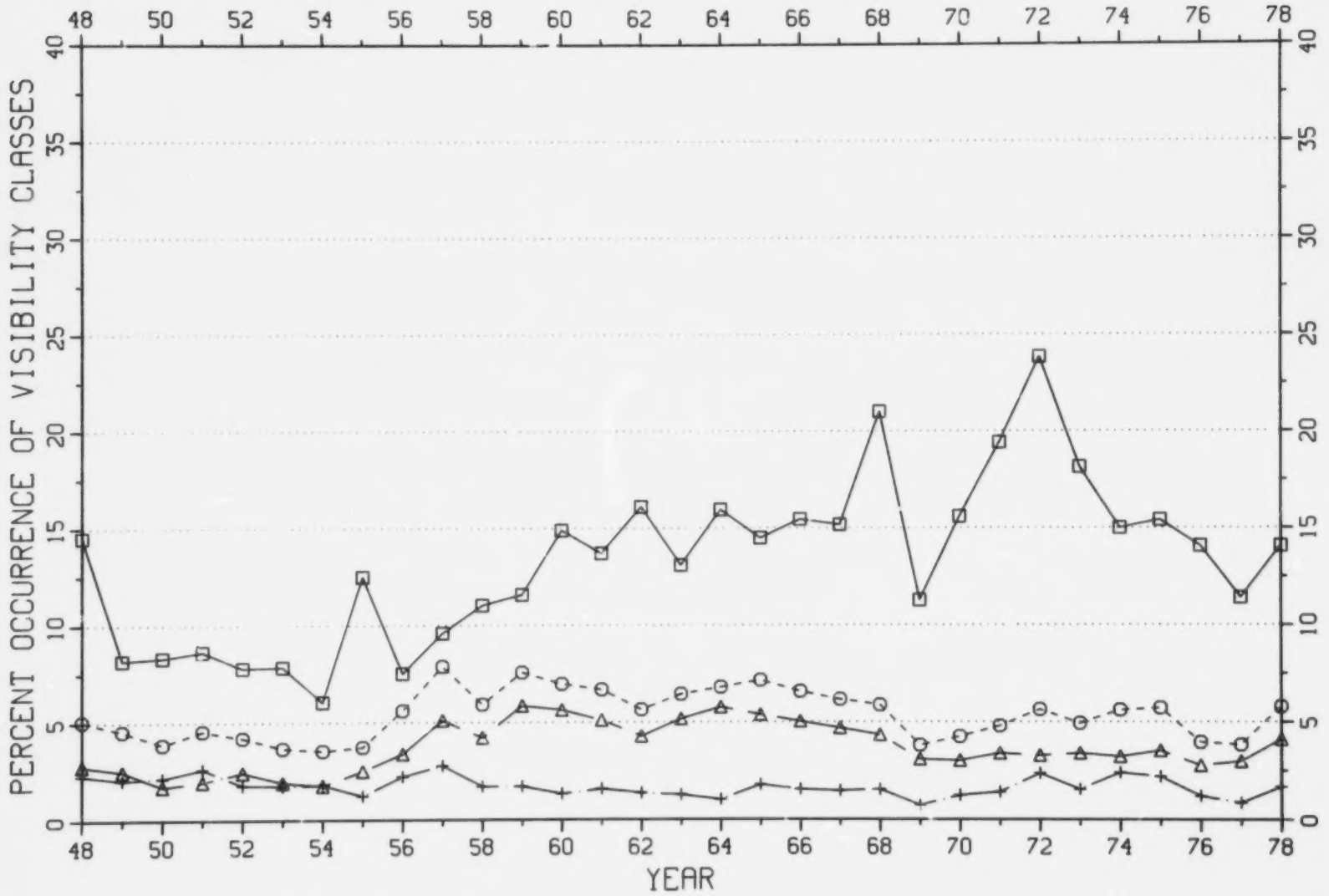
BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR CHS CHARLESTON, SC
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR CHS CHARLESTON, SC

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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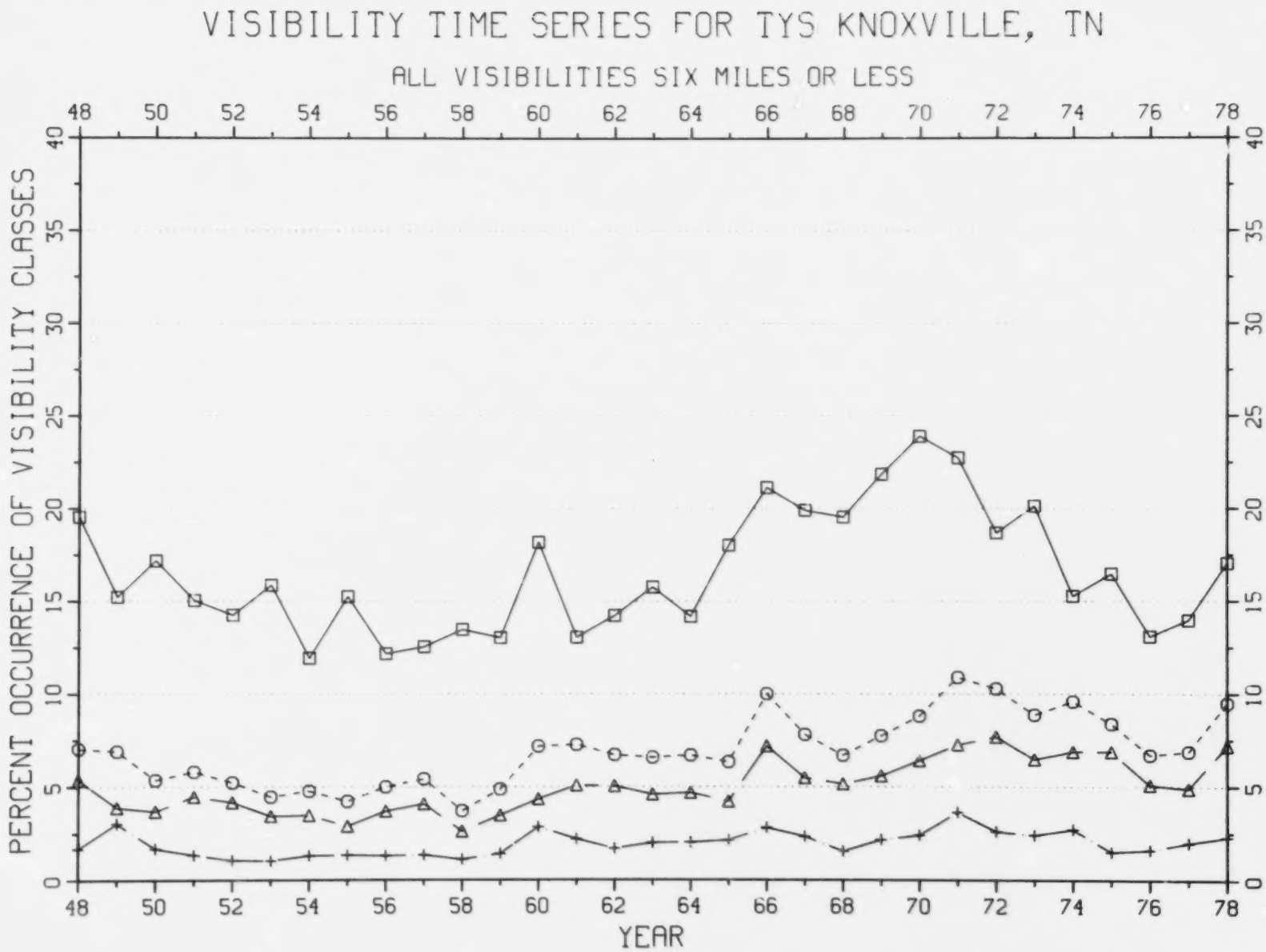
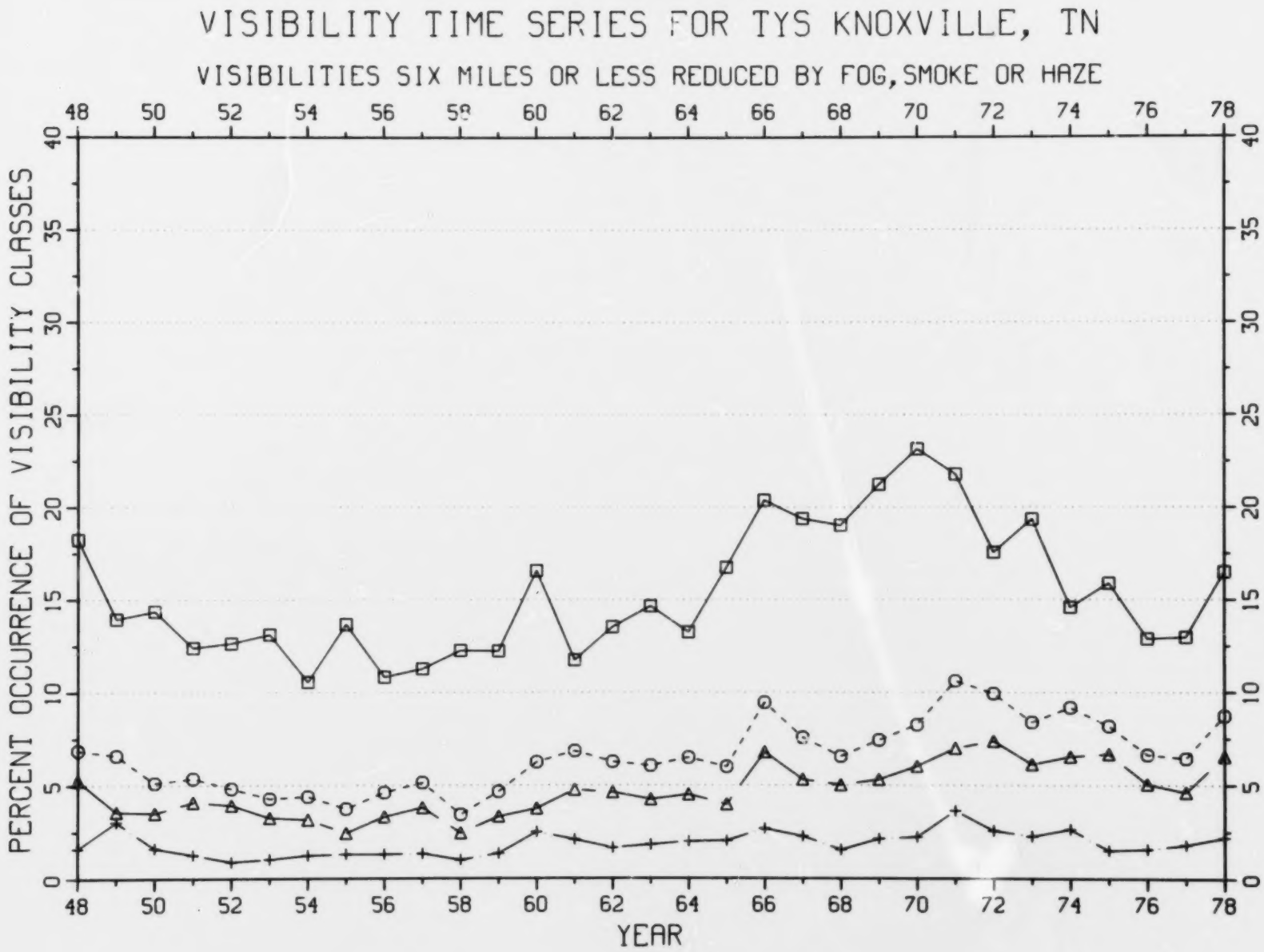

VISIBILITY TIME SERIES FOR TYS KNOXVILLE, TN
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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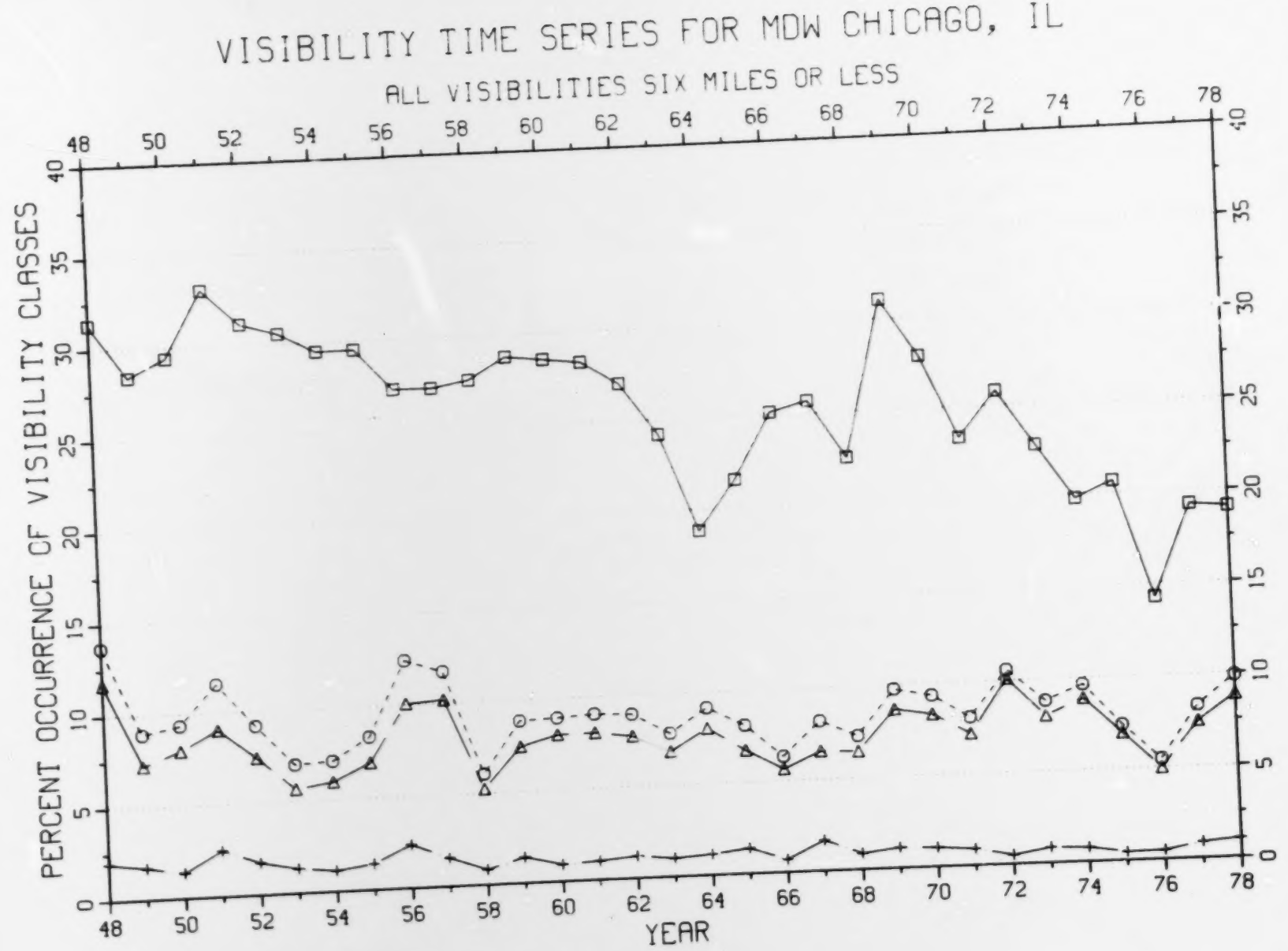

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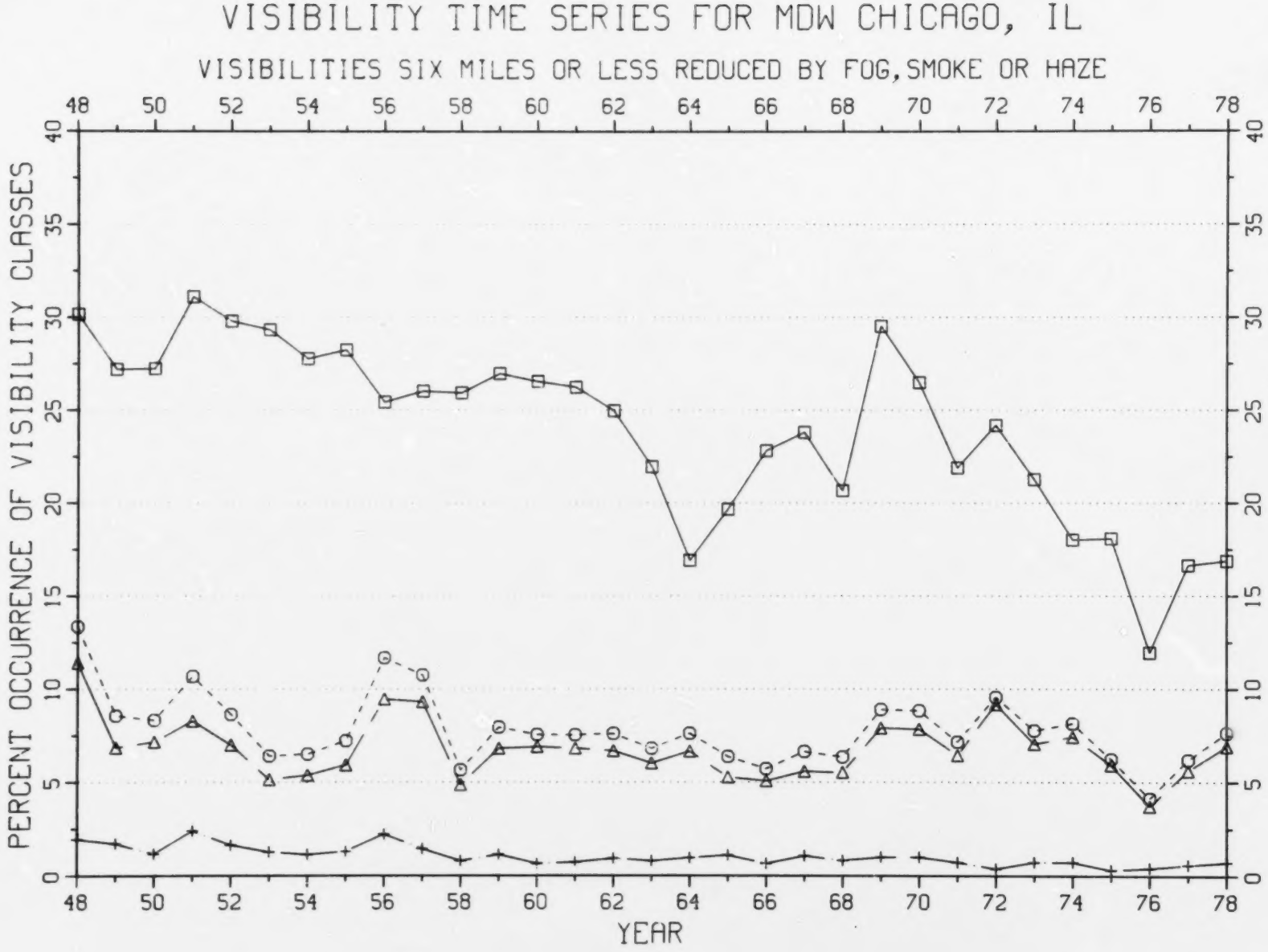
VISIBILITY TIME SERIES FOR MDW CHICAGO, IL
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

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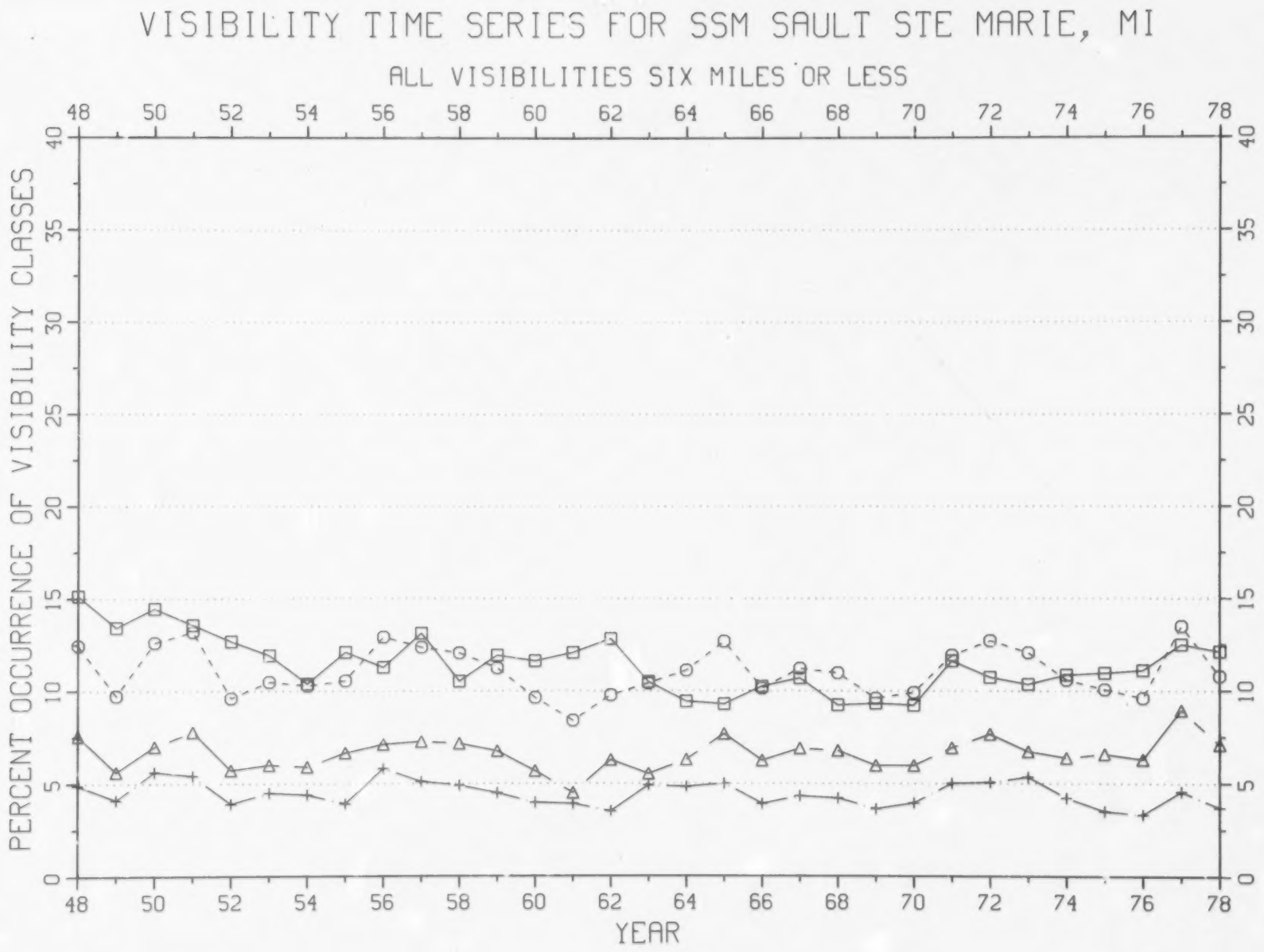

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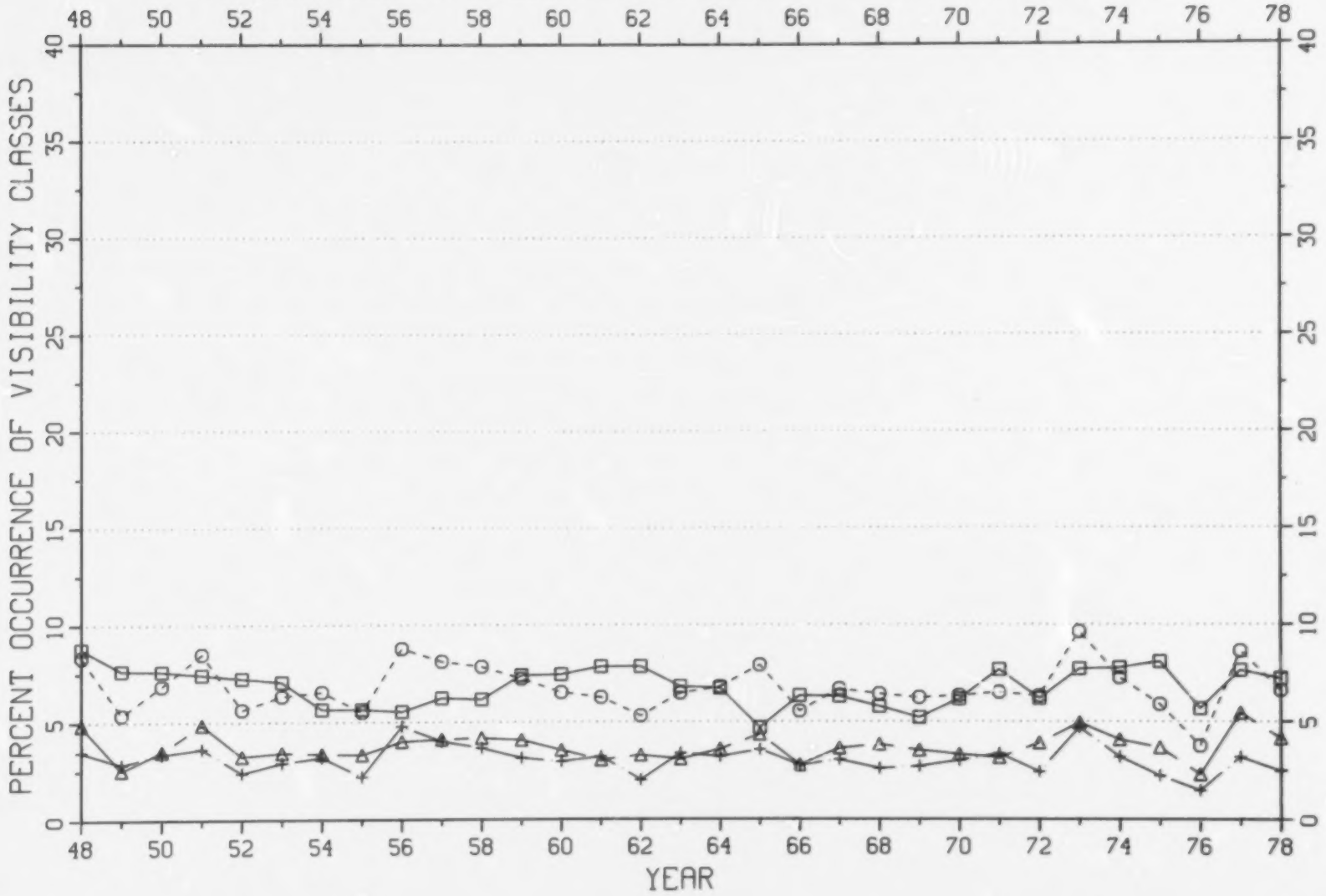
VISIBILITY TIME SERIES FOR SSM SAULT STE MARIE, MI

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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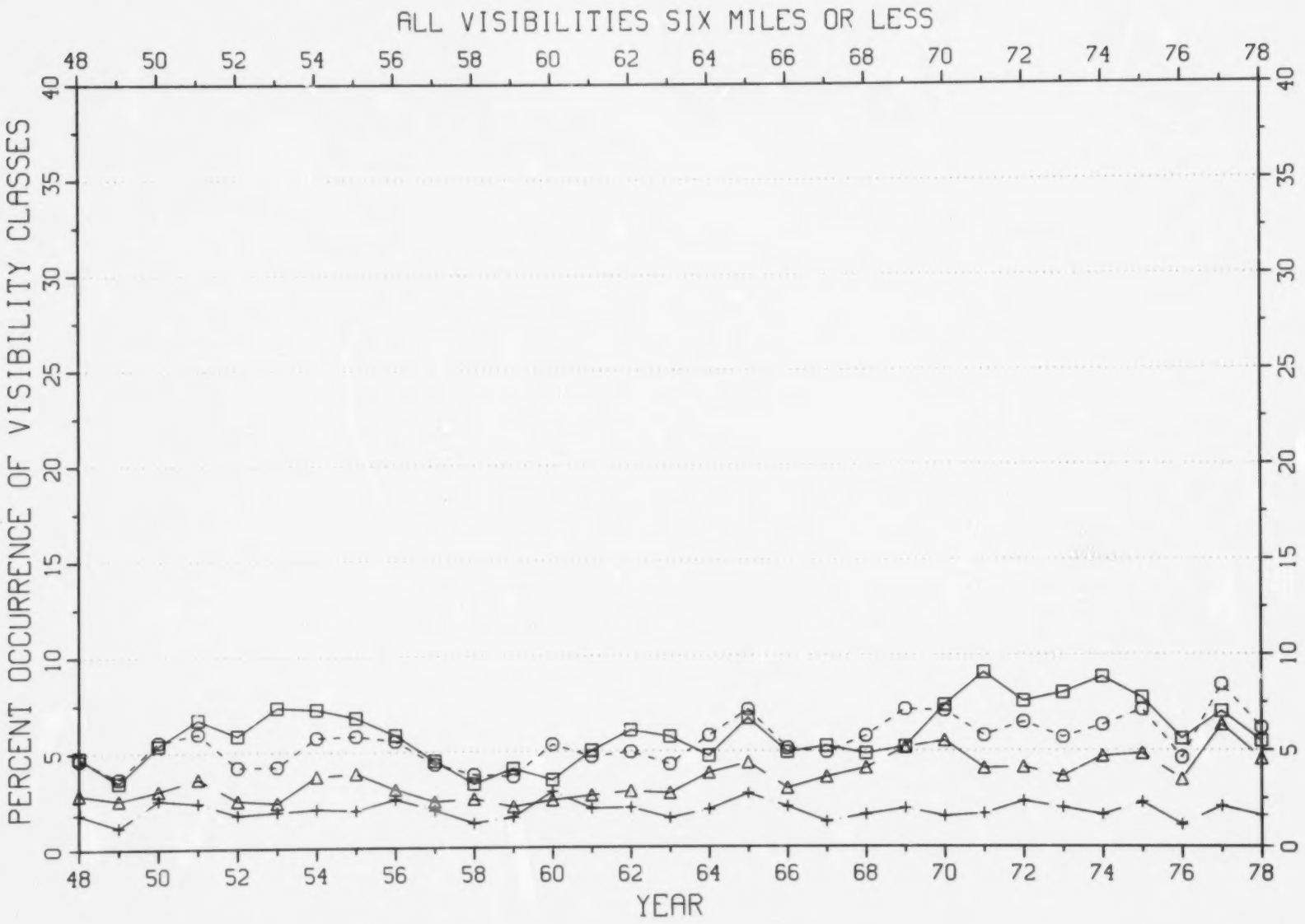
VISIBILITY TIME SERIES FOR INL INTERNATIONAL FALLS, MN



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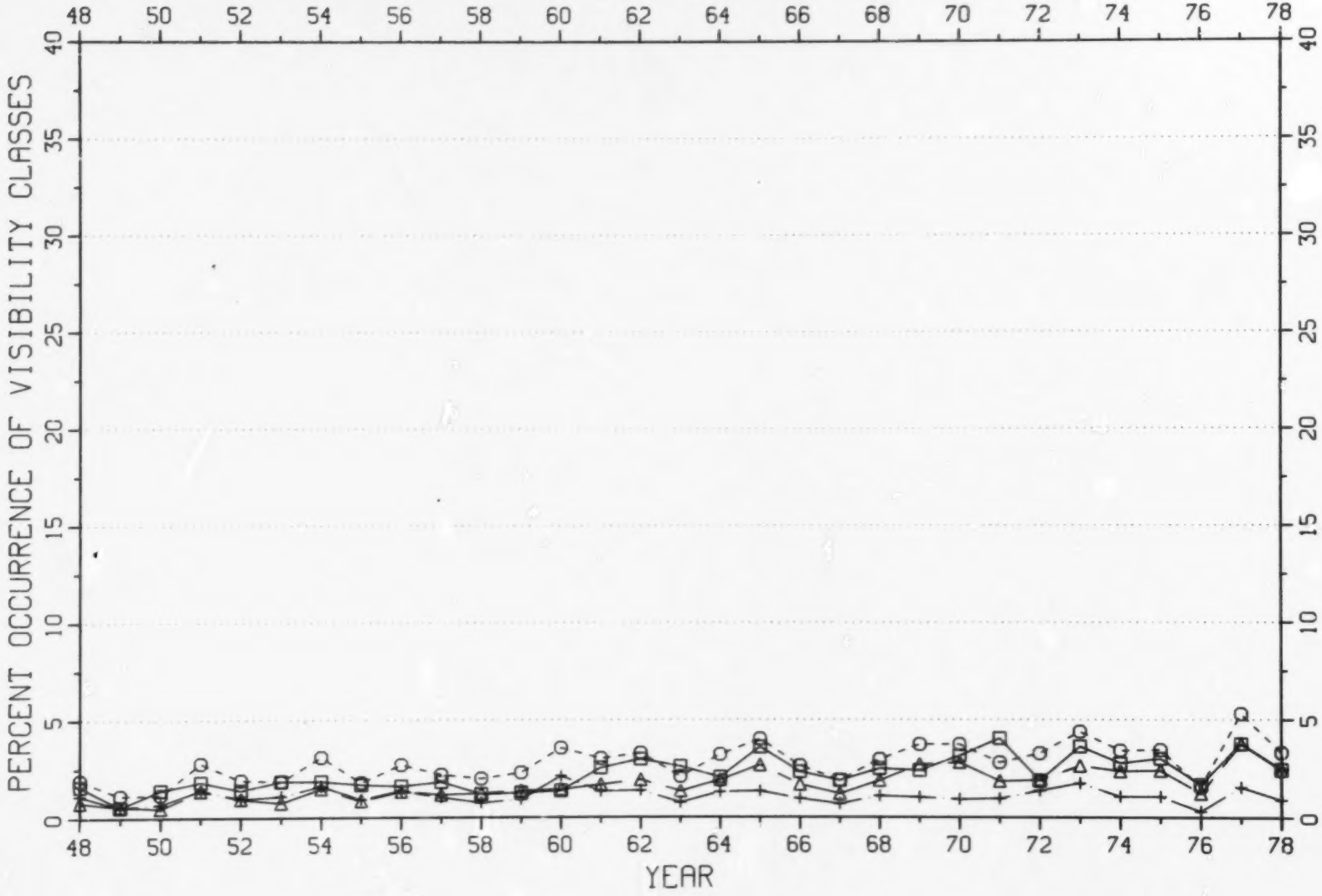
VISIBILITY TIME SERIES FOR INL INTERNATIONAL FALLS, MN

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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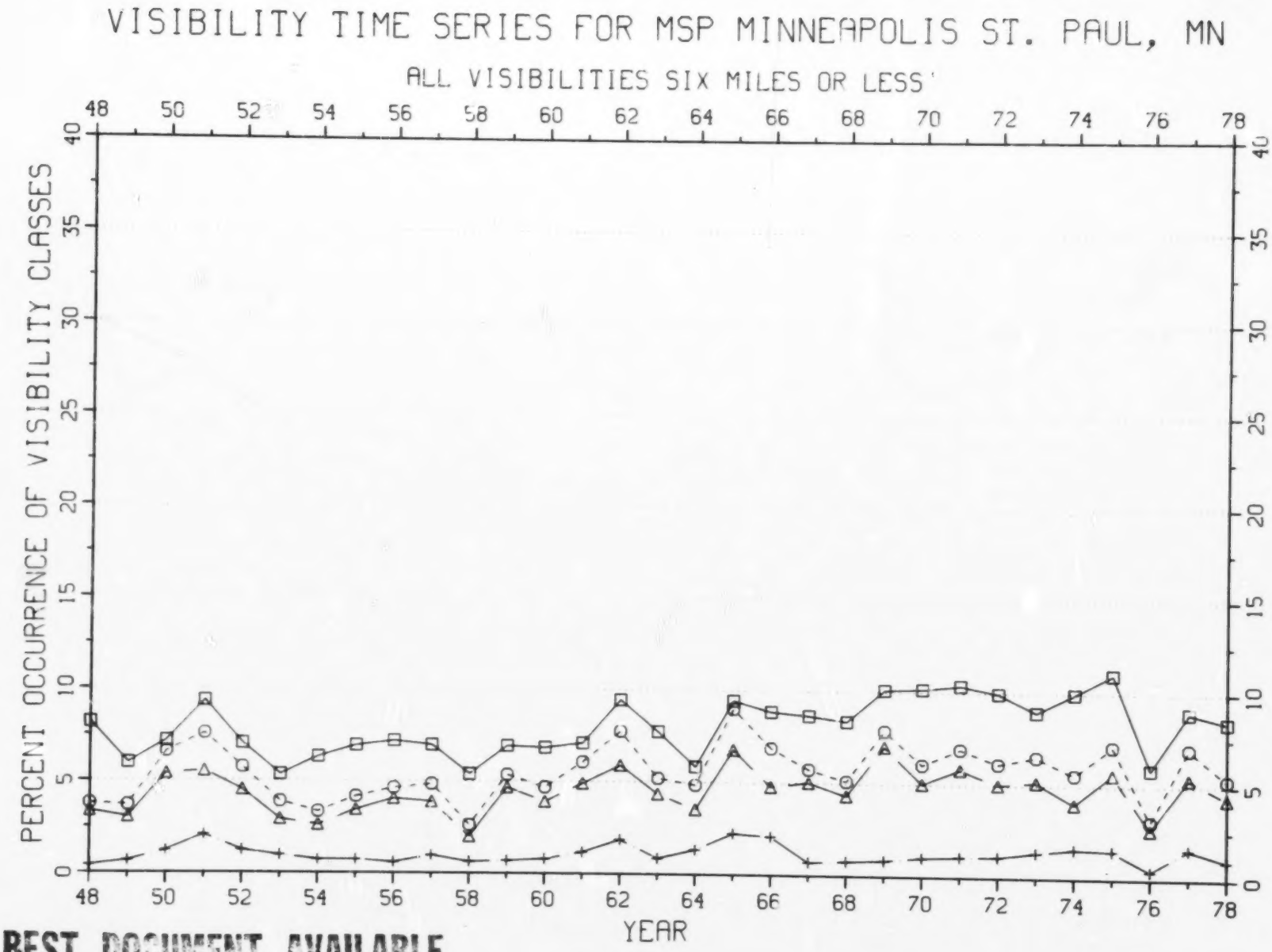
VISIBILITY TIME SERIES FOR MSP MINNEAPOLIS ST. PAUL, MN
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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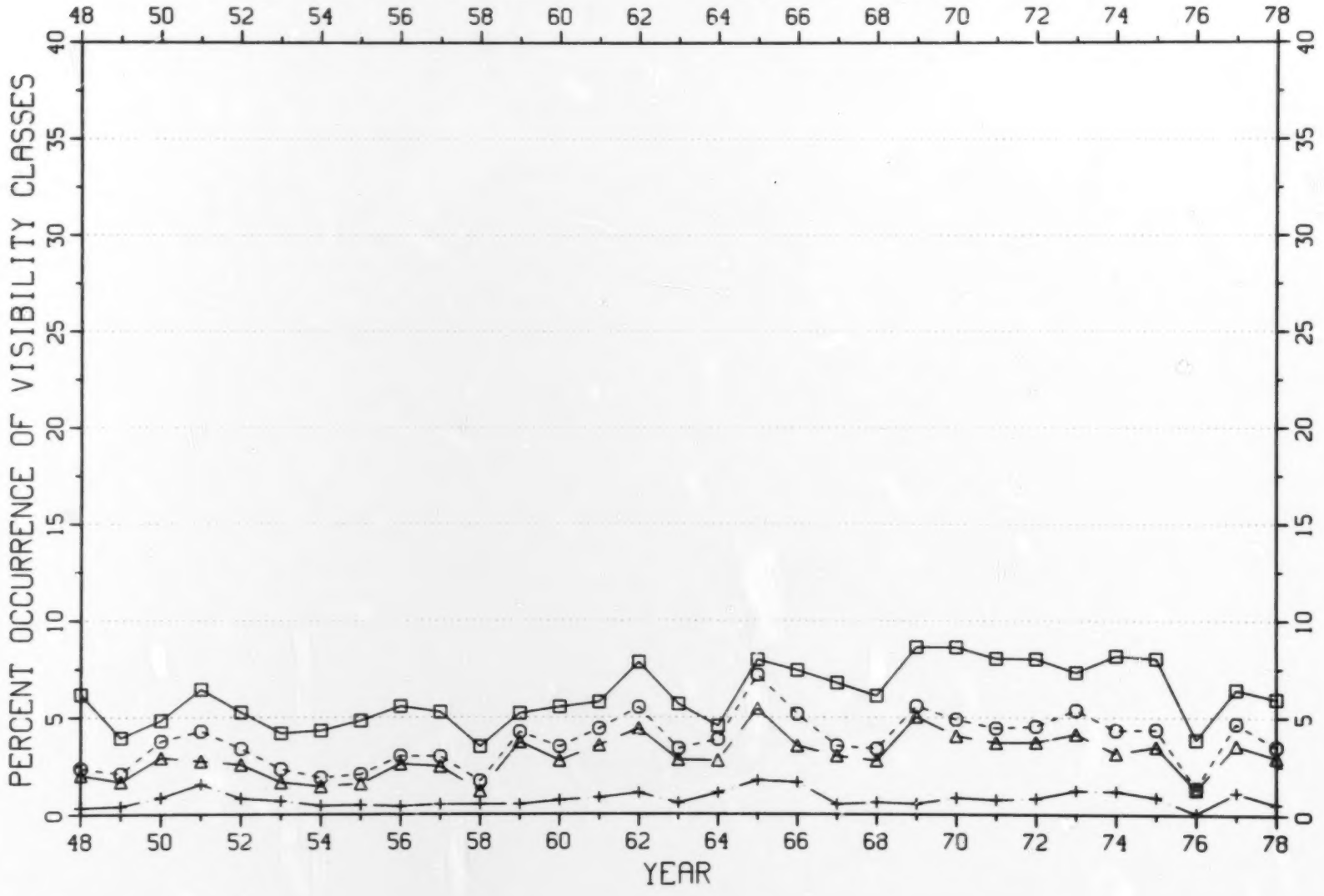
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR MSP MINNEAPOLIS ST. PAUL, MN



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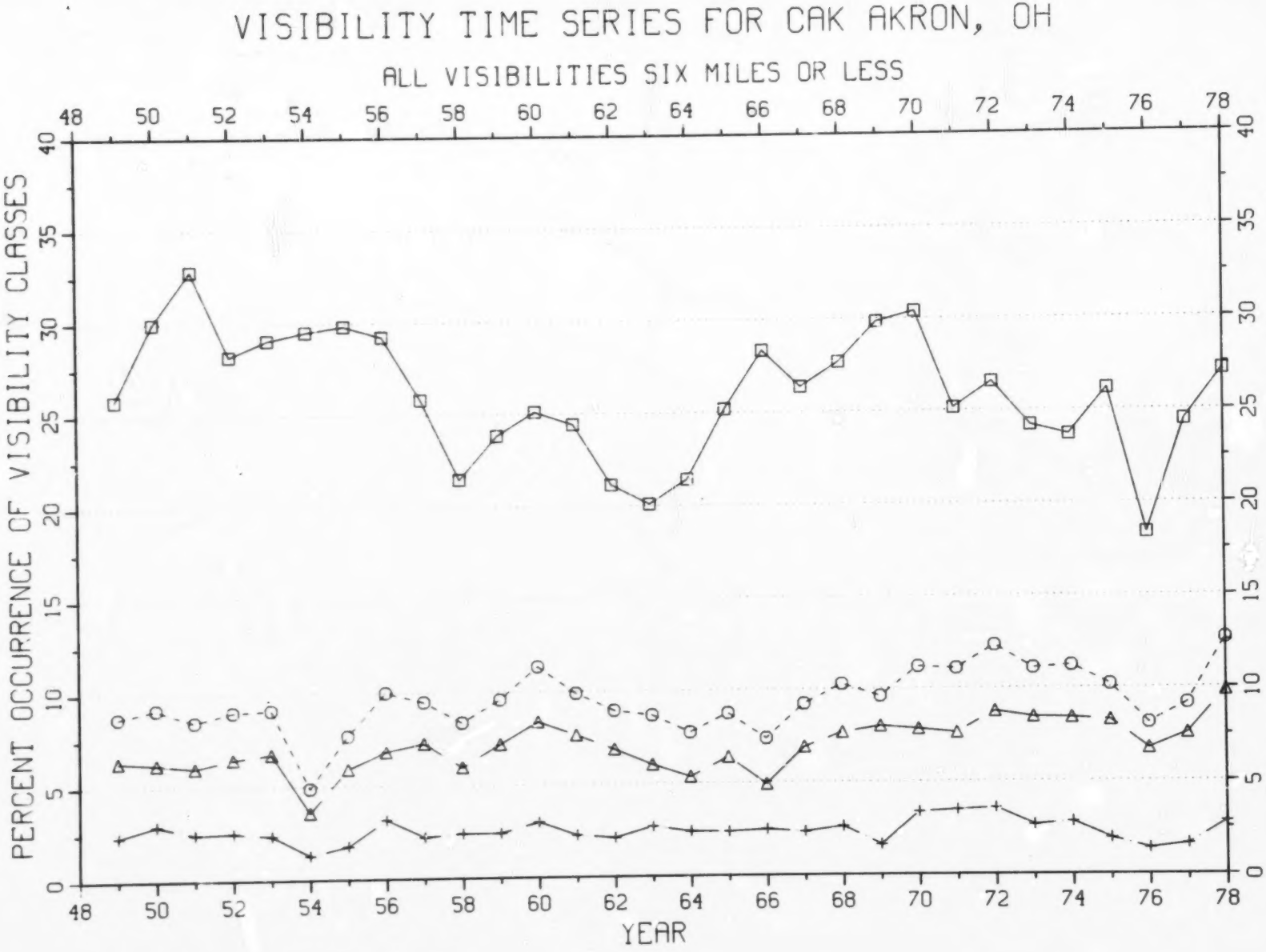

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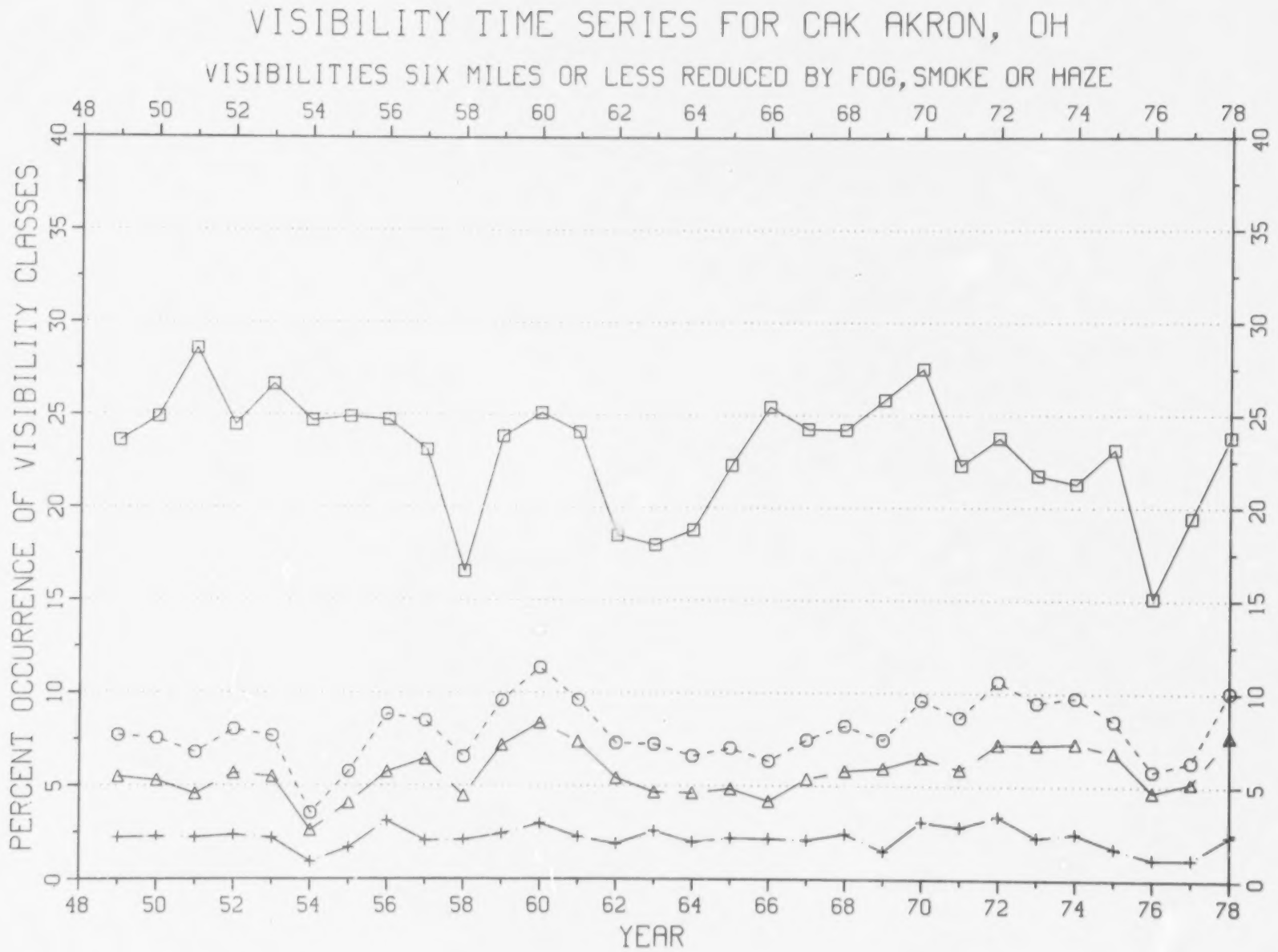
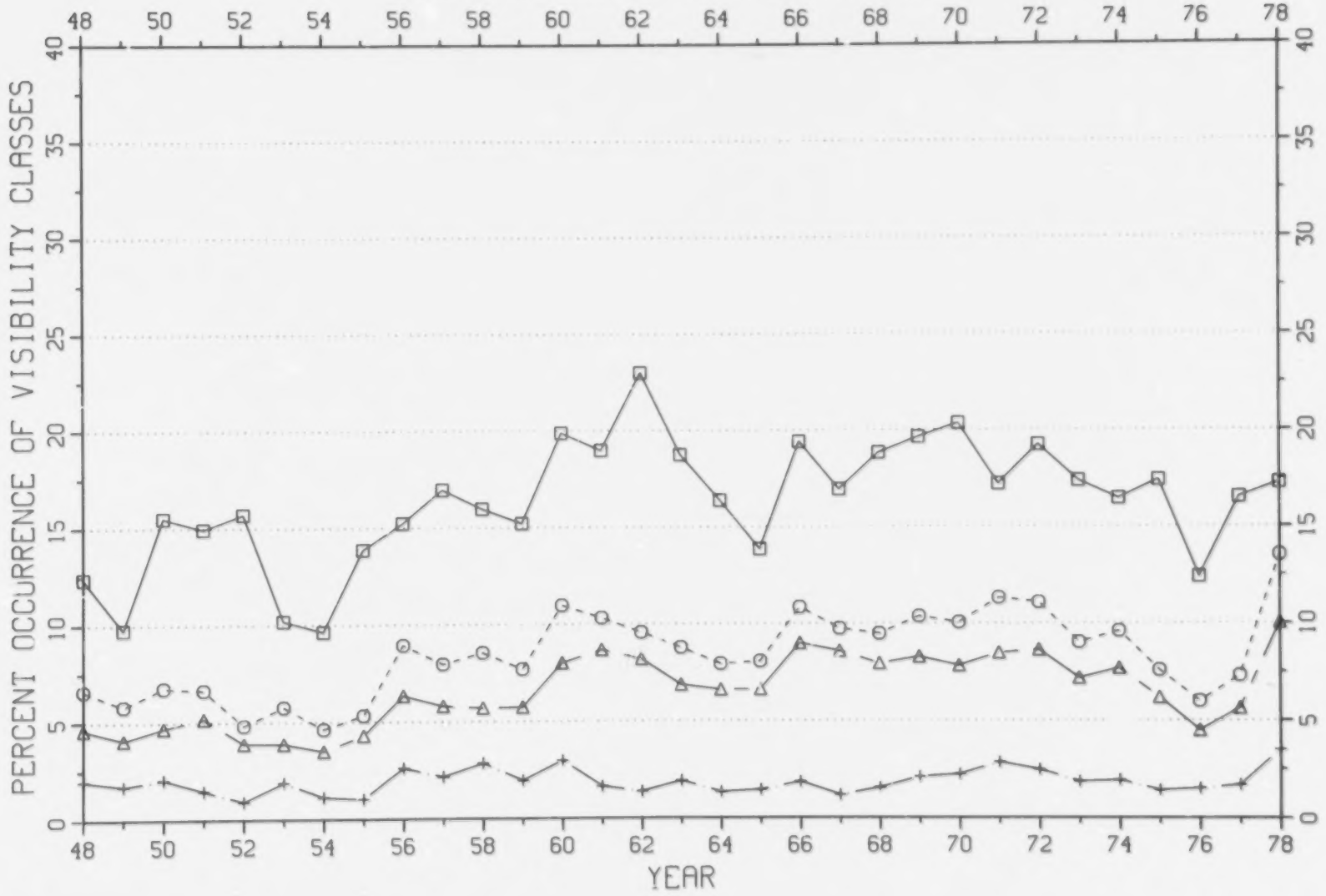

VISIBILITY TIME SERIES FOR CAK AKRON, OH
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR CVG CINCINNATI, OH
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

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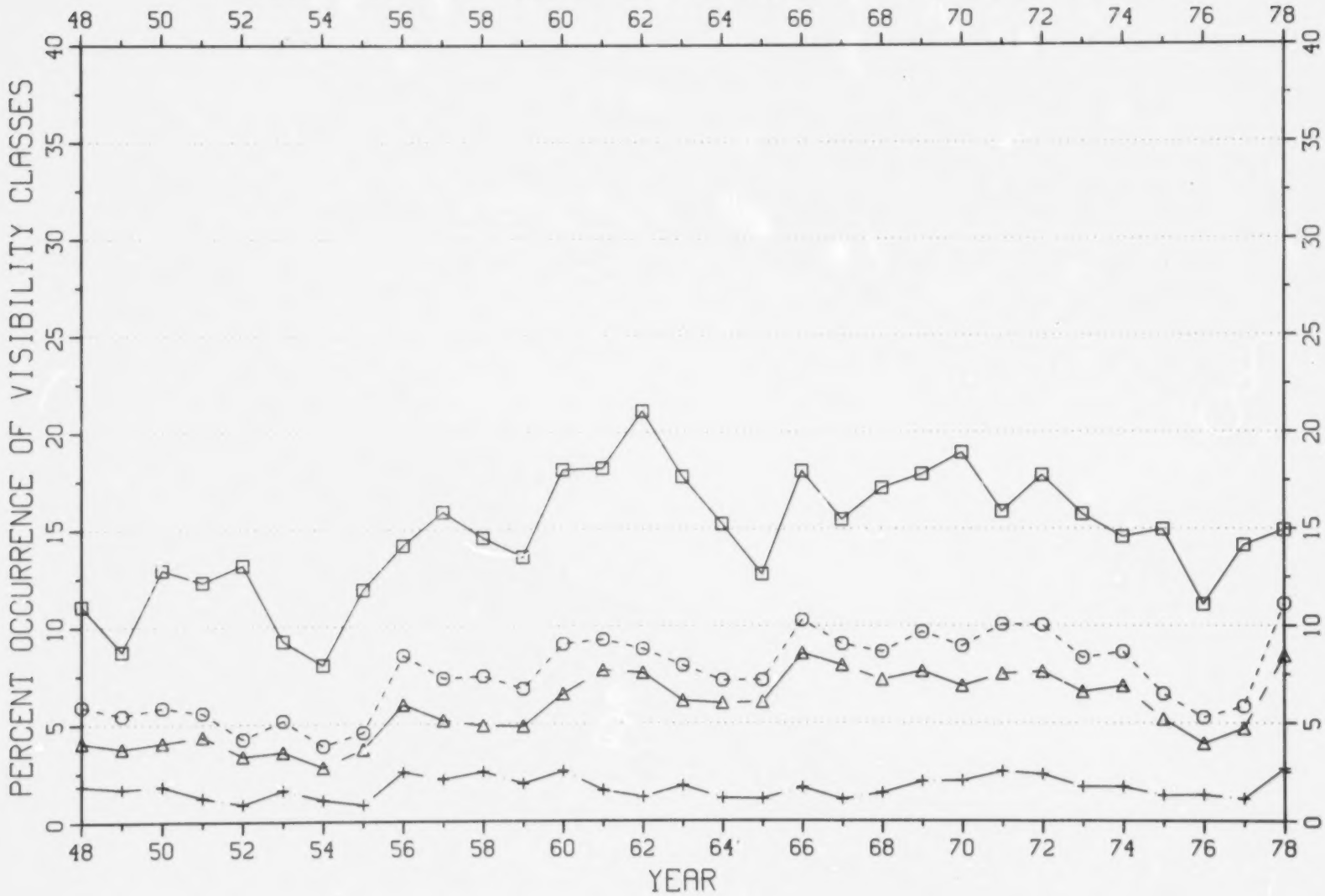
VISIBILITY TIME SERIES FOR CVG CINCINNATI, OH

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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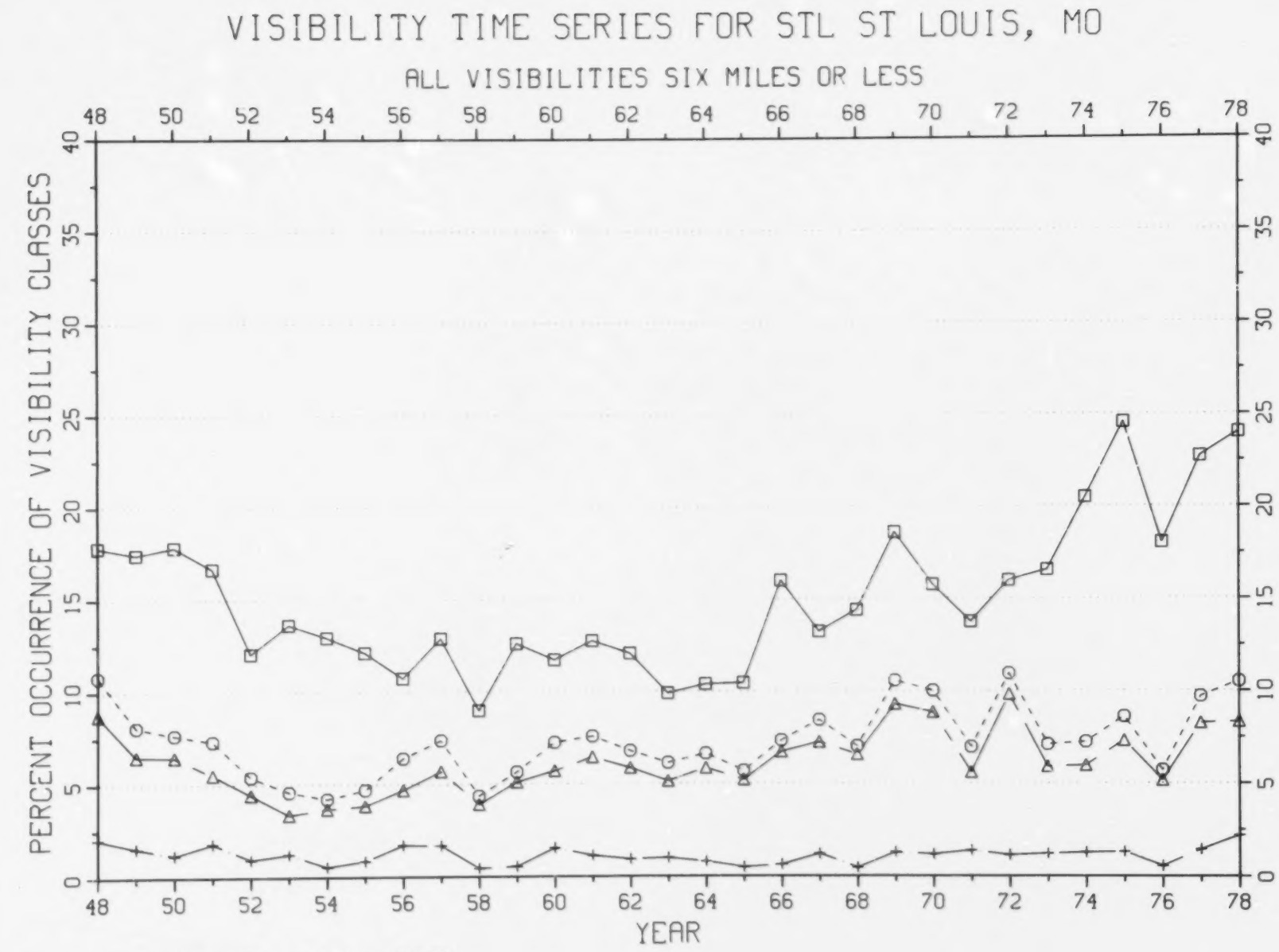
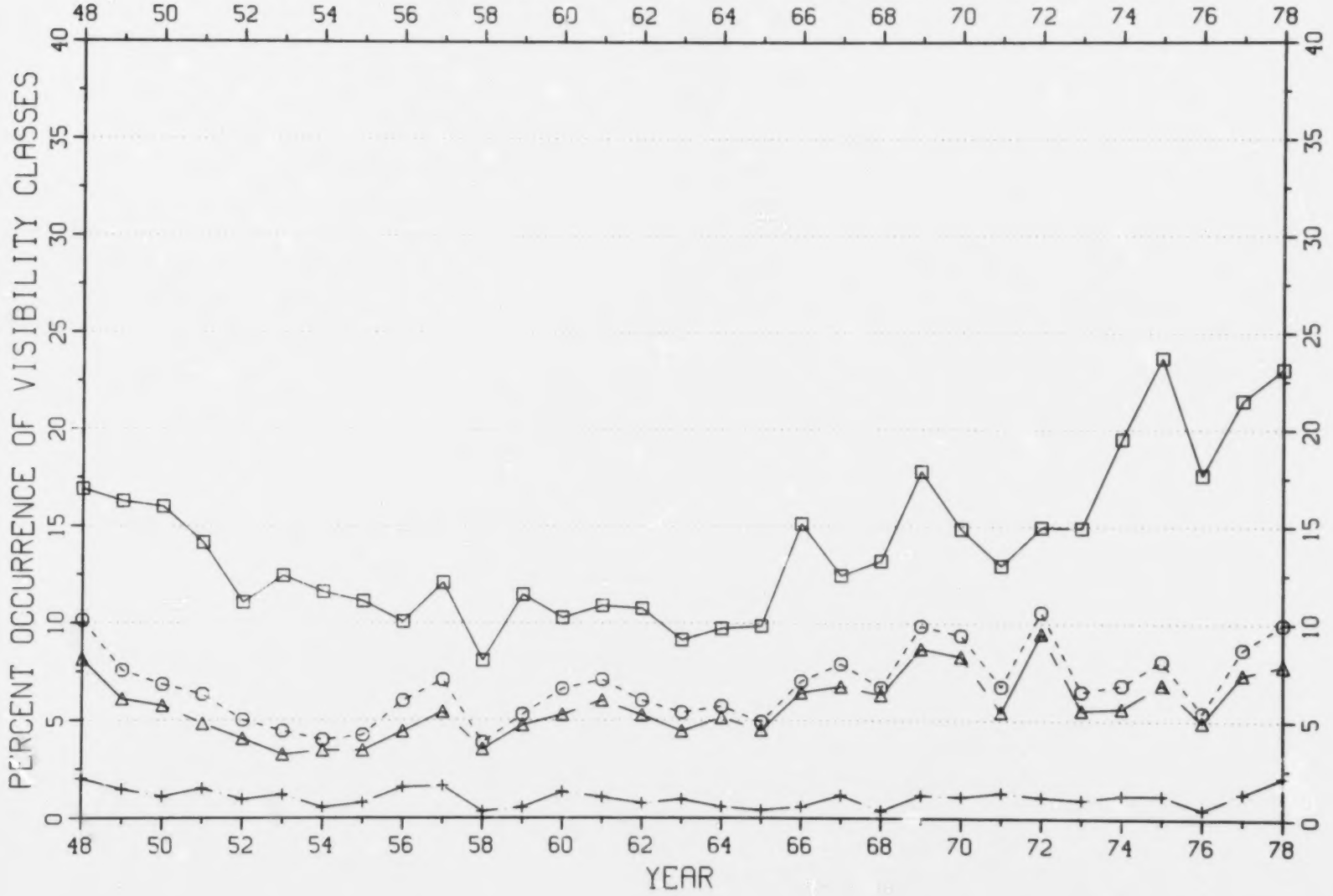

VISIBILITY TIME SERIES FOR STL ST LOUIS, MO
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR STL ST LOUIS, MO

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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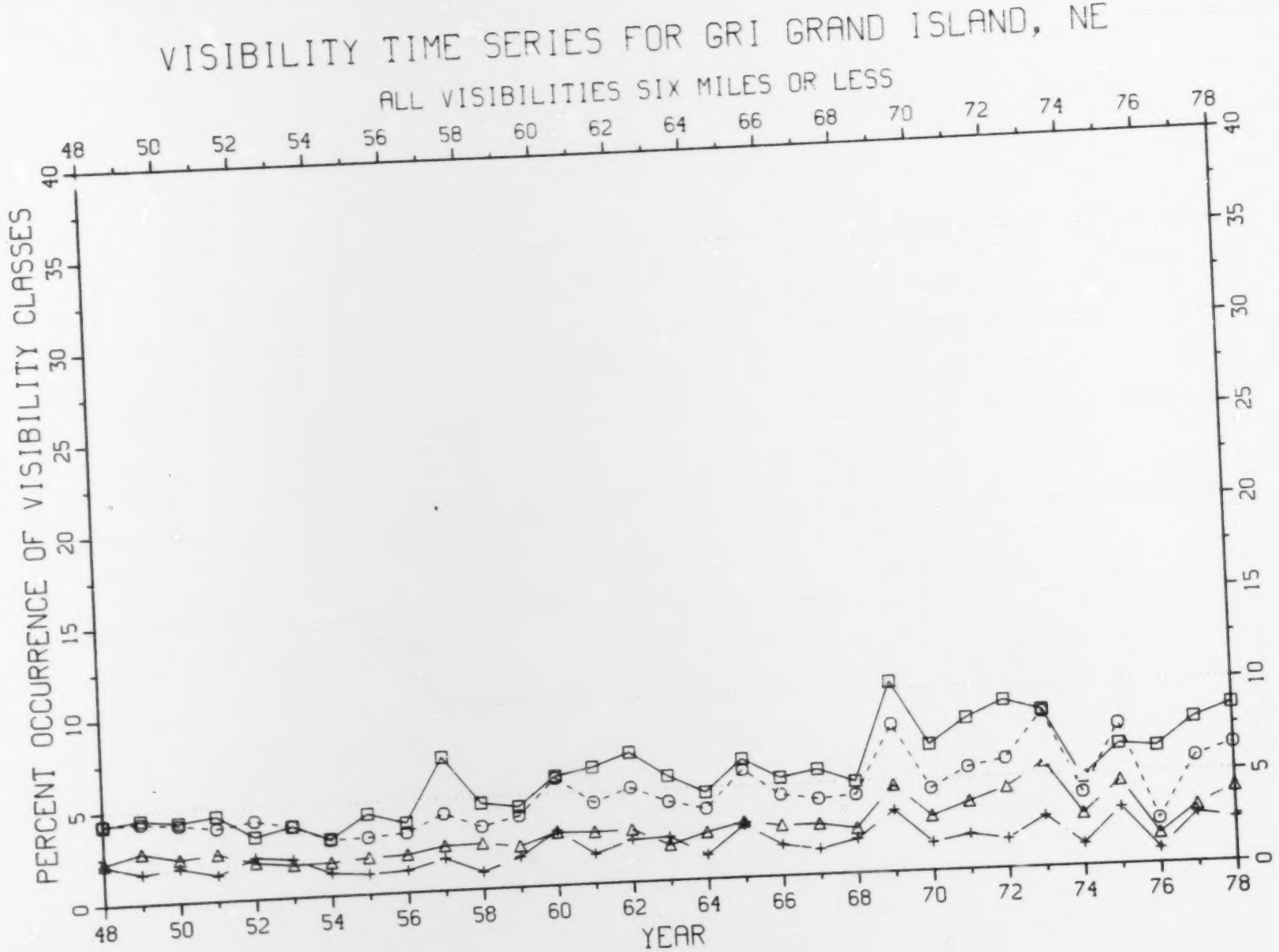

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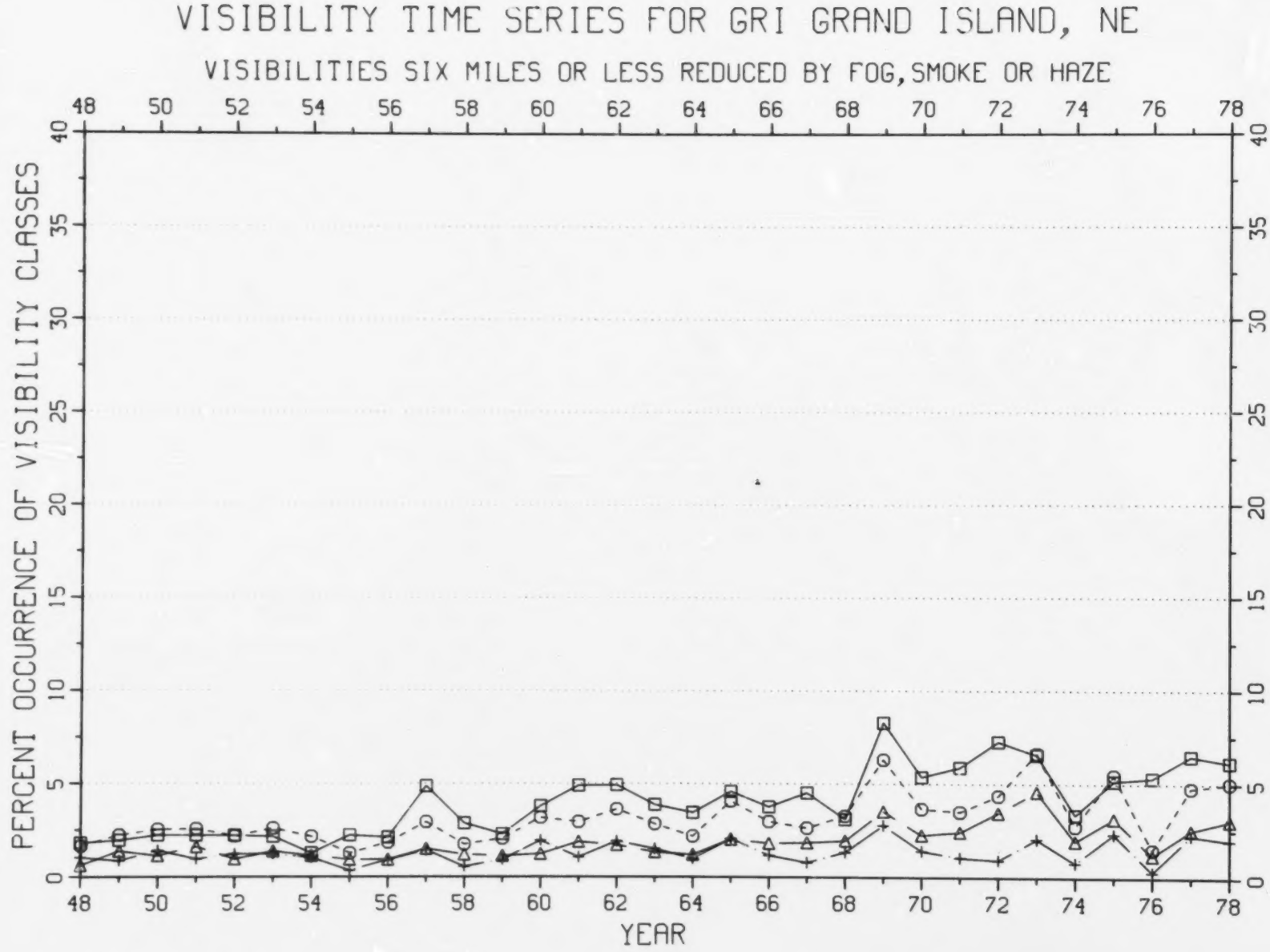

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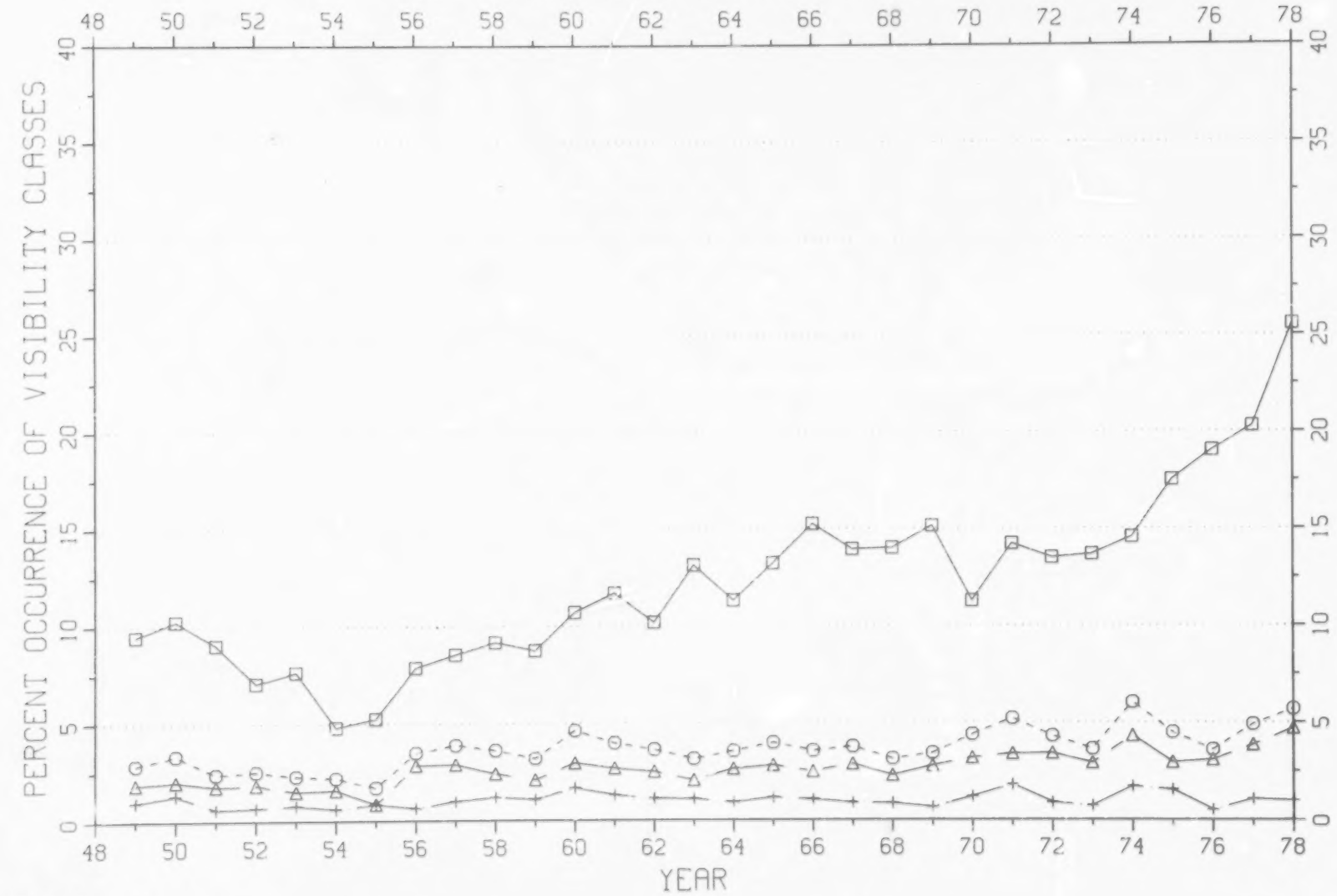

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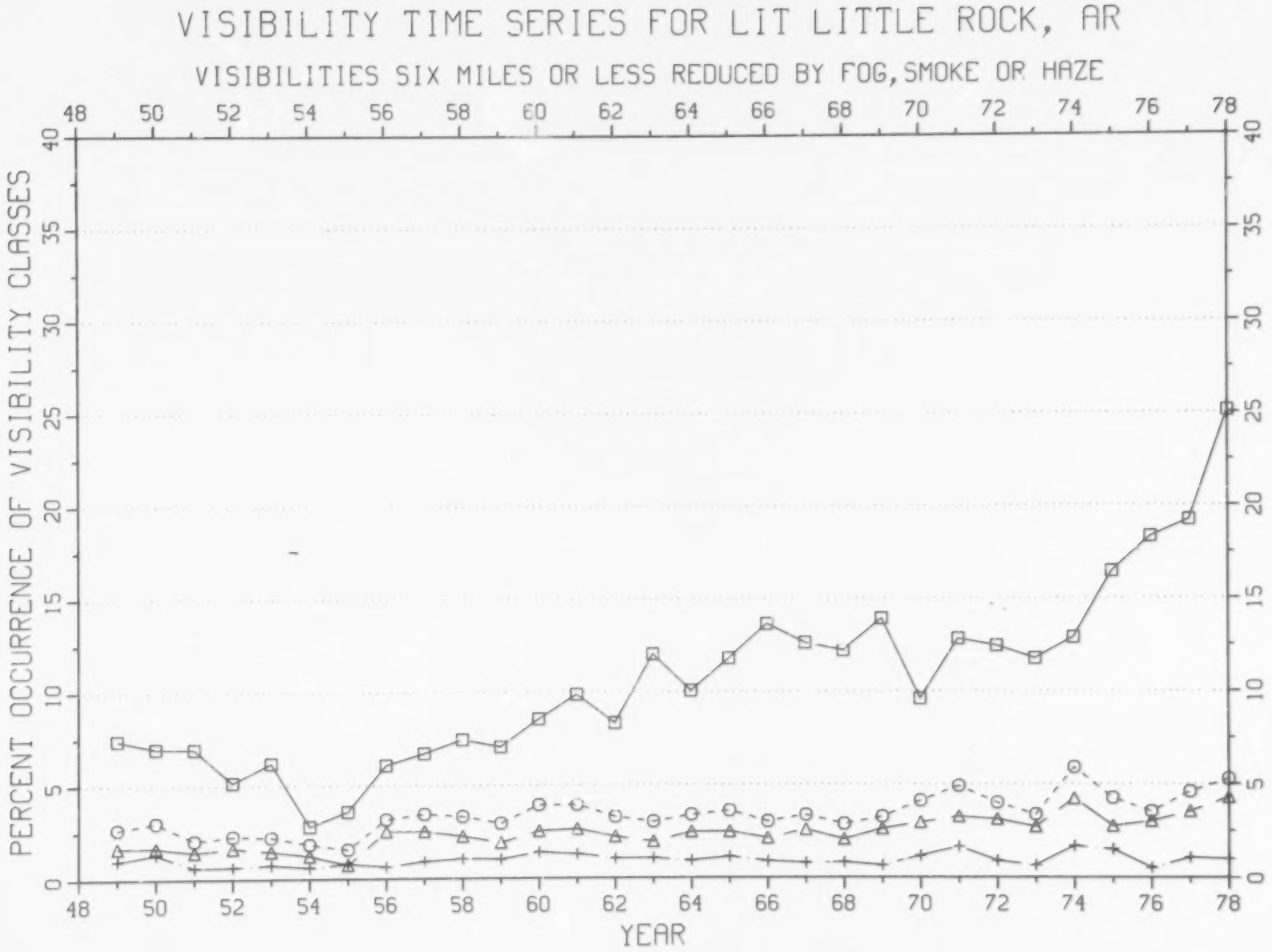
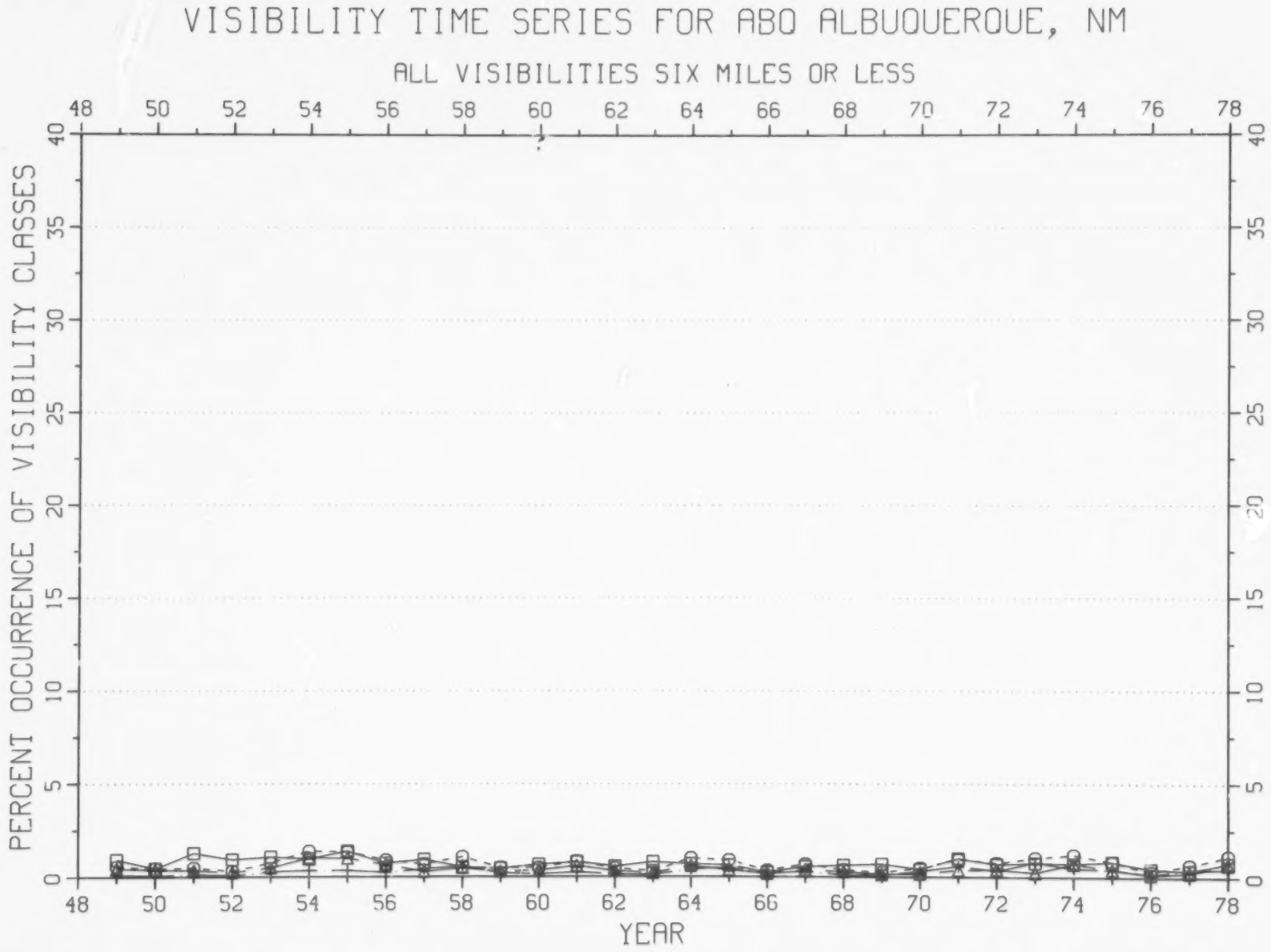

VISIBILITY TIME SERIES FOR LIT LITTLE ROCK, AR
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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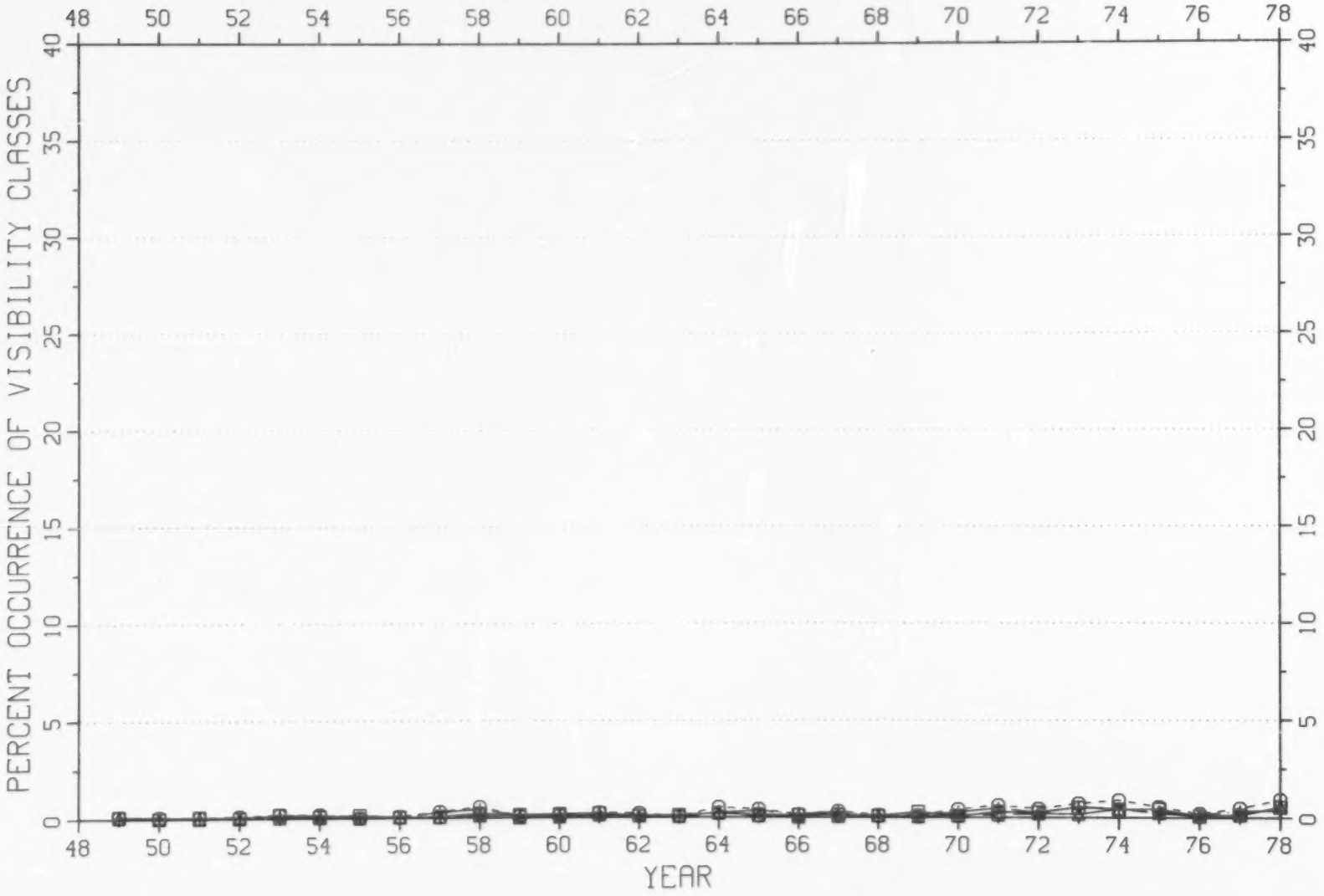
VISIBILITY TIME SERIES FOR ABO ALBUQUERQUE, NM

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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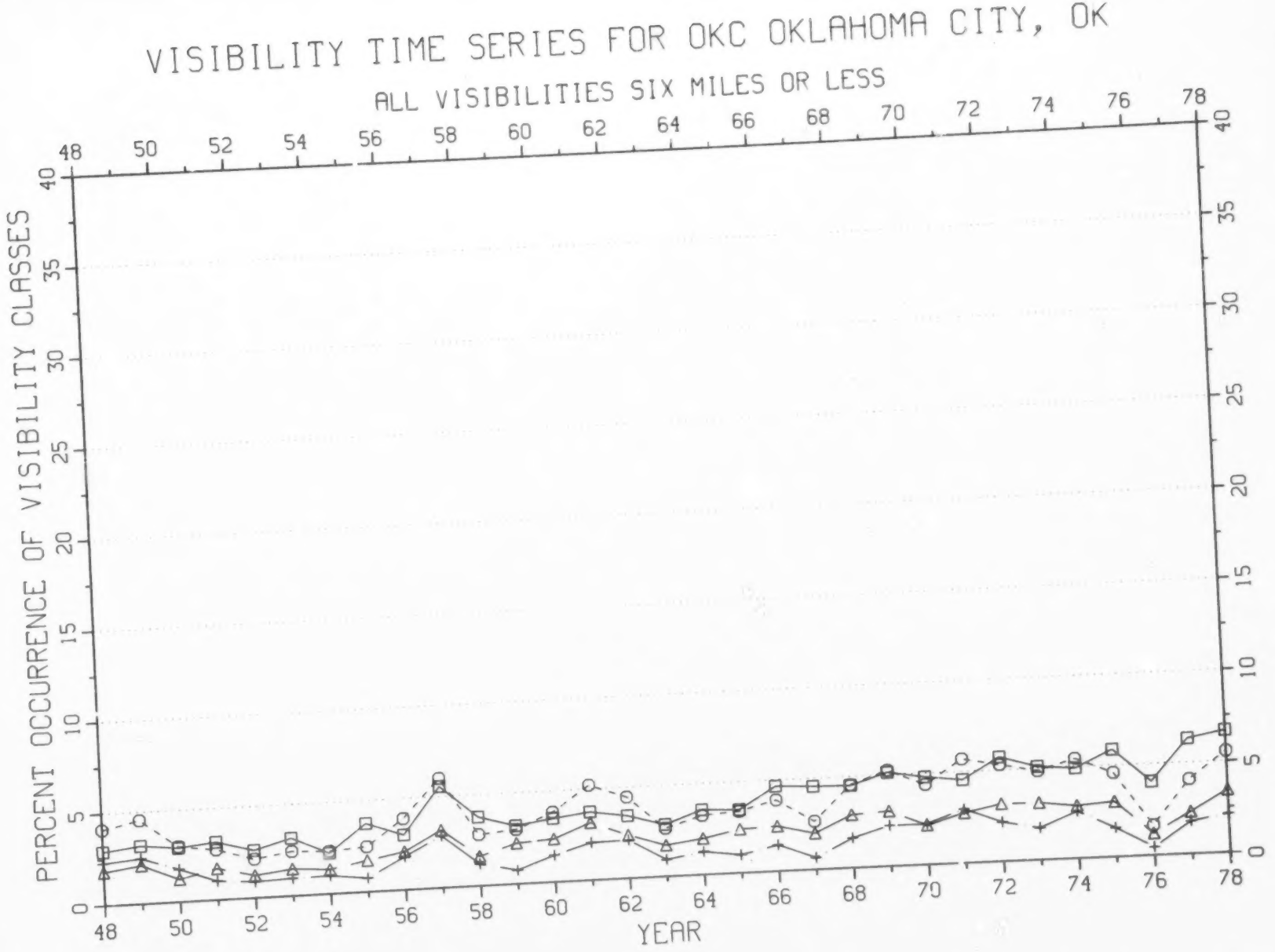
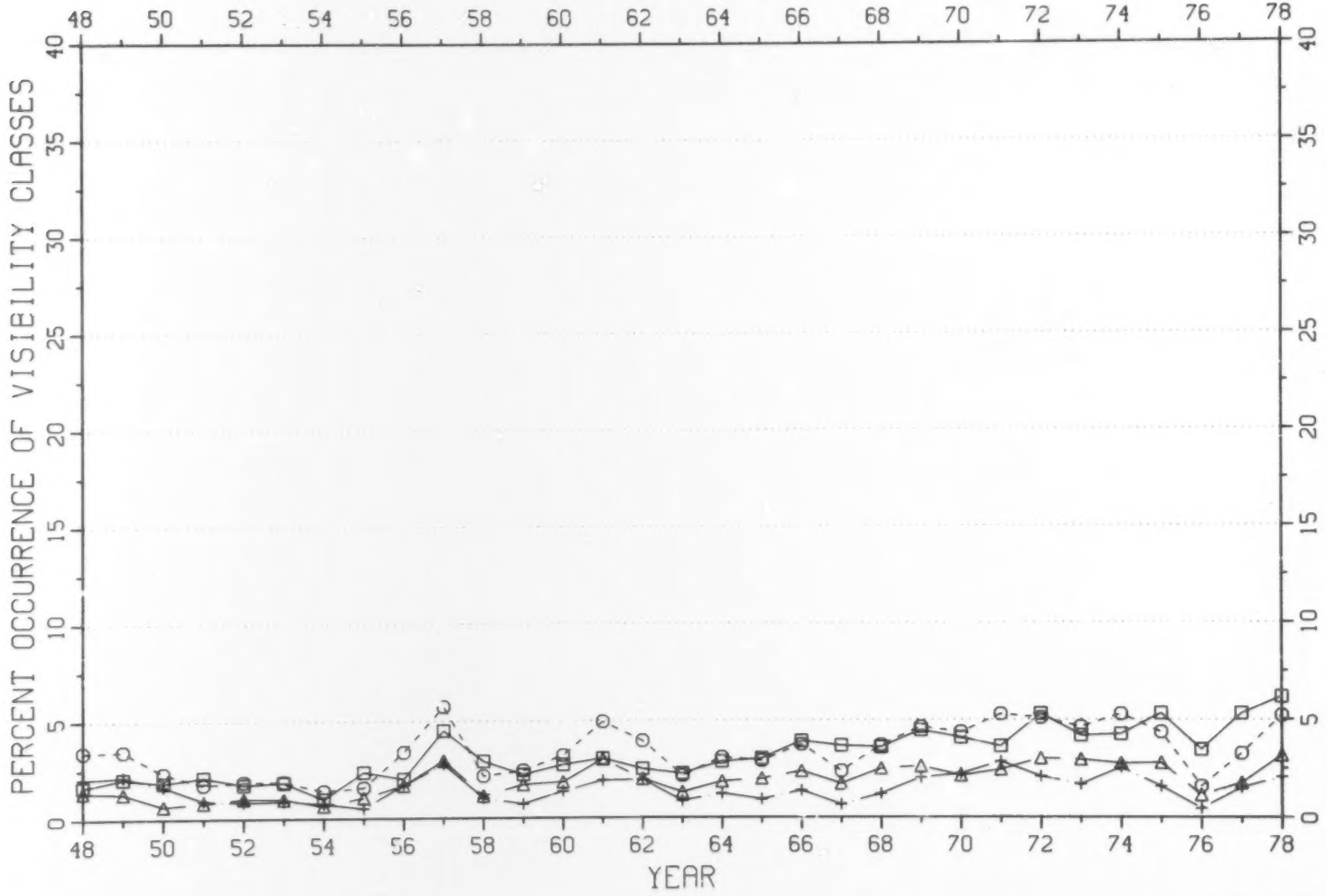

VISIBILITY TIME SERIES FOR OKC OKLAHOMA CITY, OK
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR OKC OKLAHOMA CITY, OK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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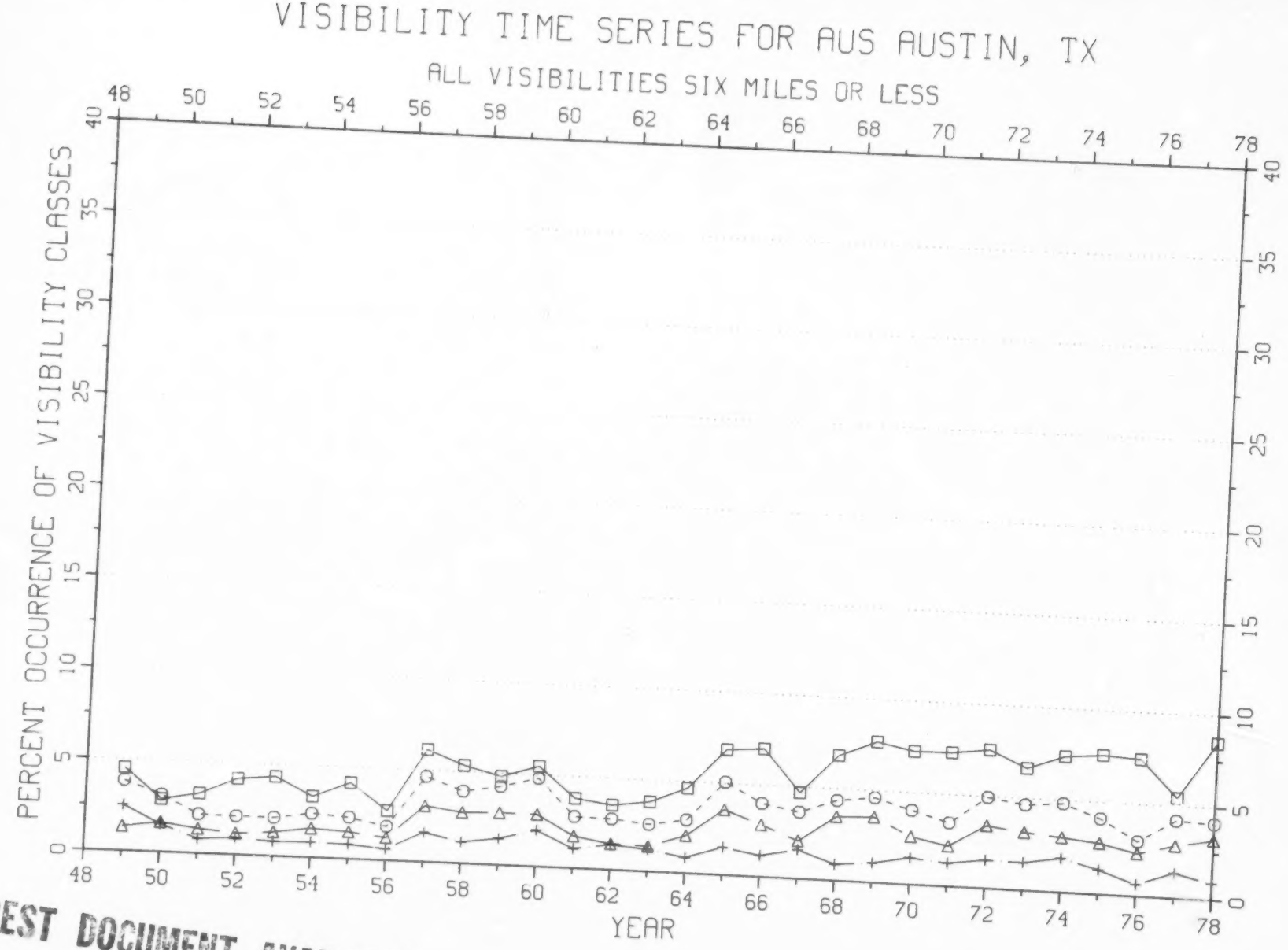

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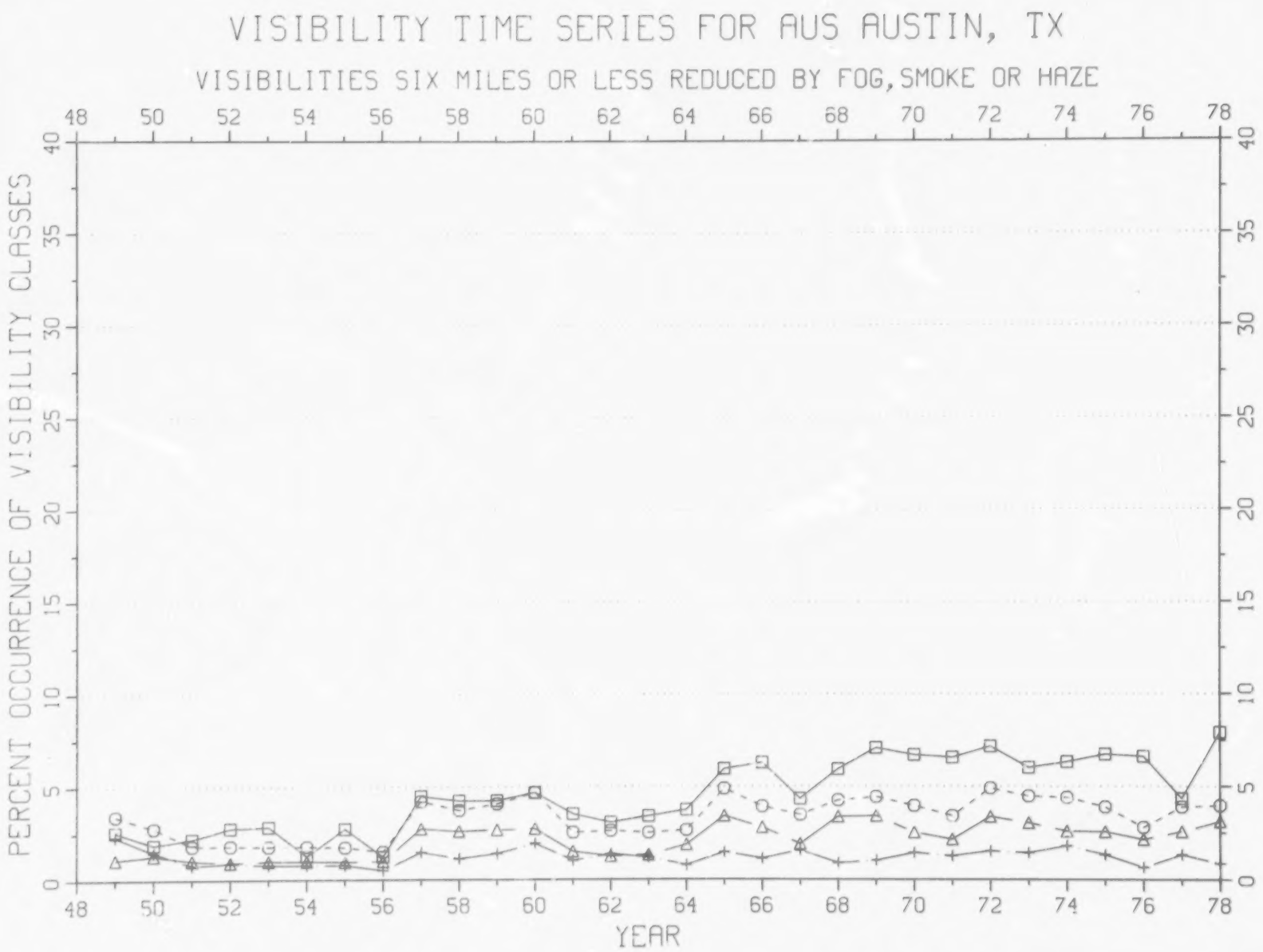
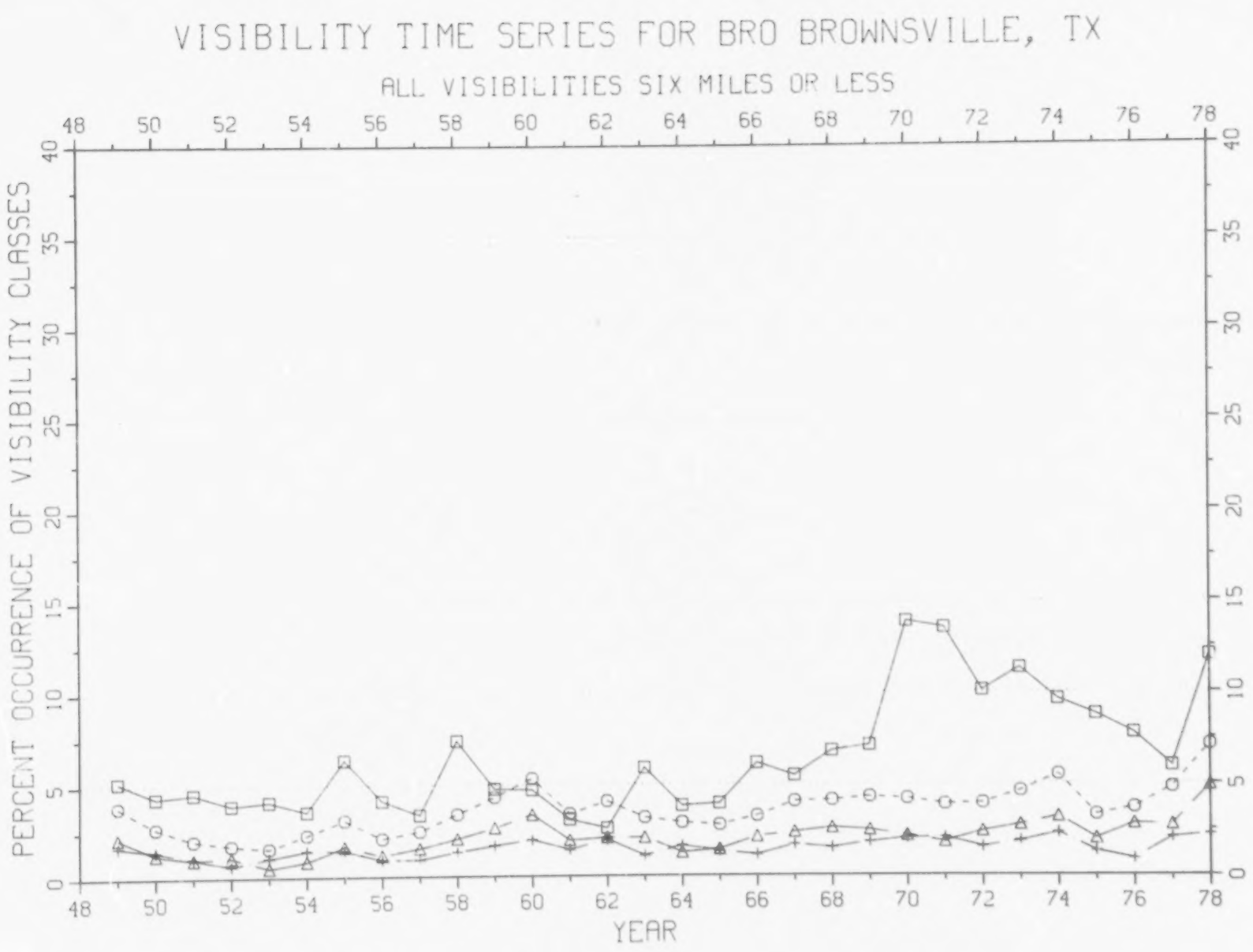

VISIBILITY TIME SERIES FOR AUS AUSTIN, TX
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

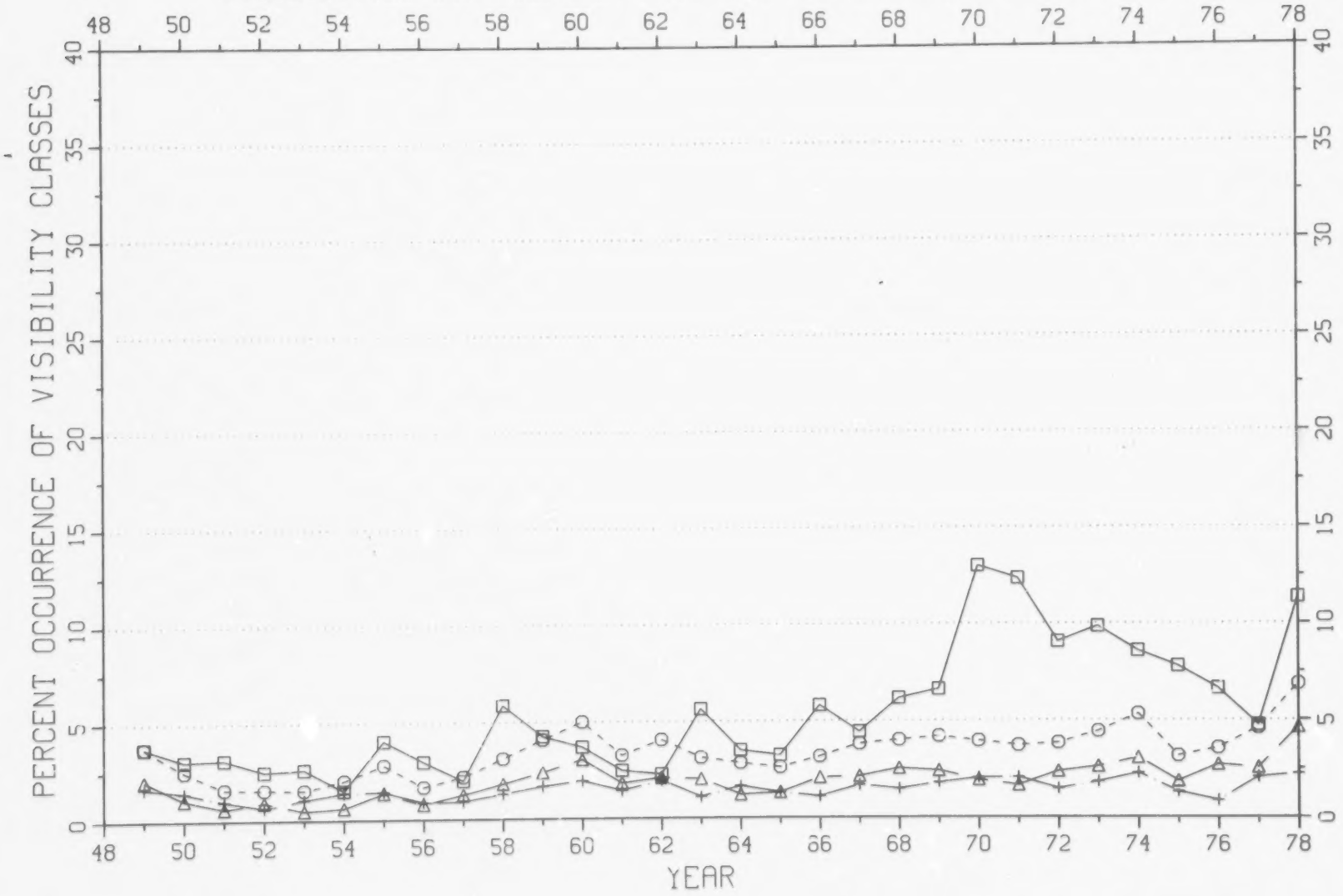
BEST DOCUMENT AVAILABLE


VISIBILITY TIME SERIES FOR BRO BROWNSVILLE, TX
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR BRO BROWNSVILLE, TX

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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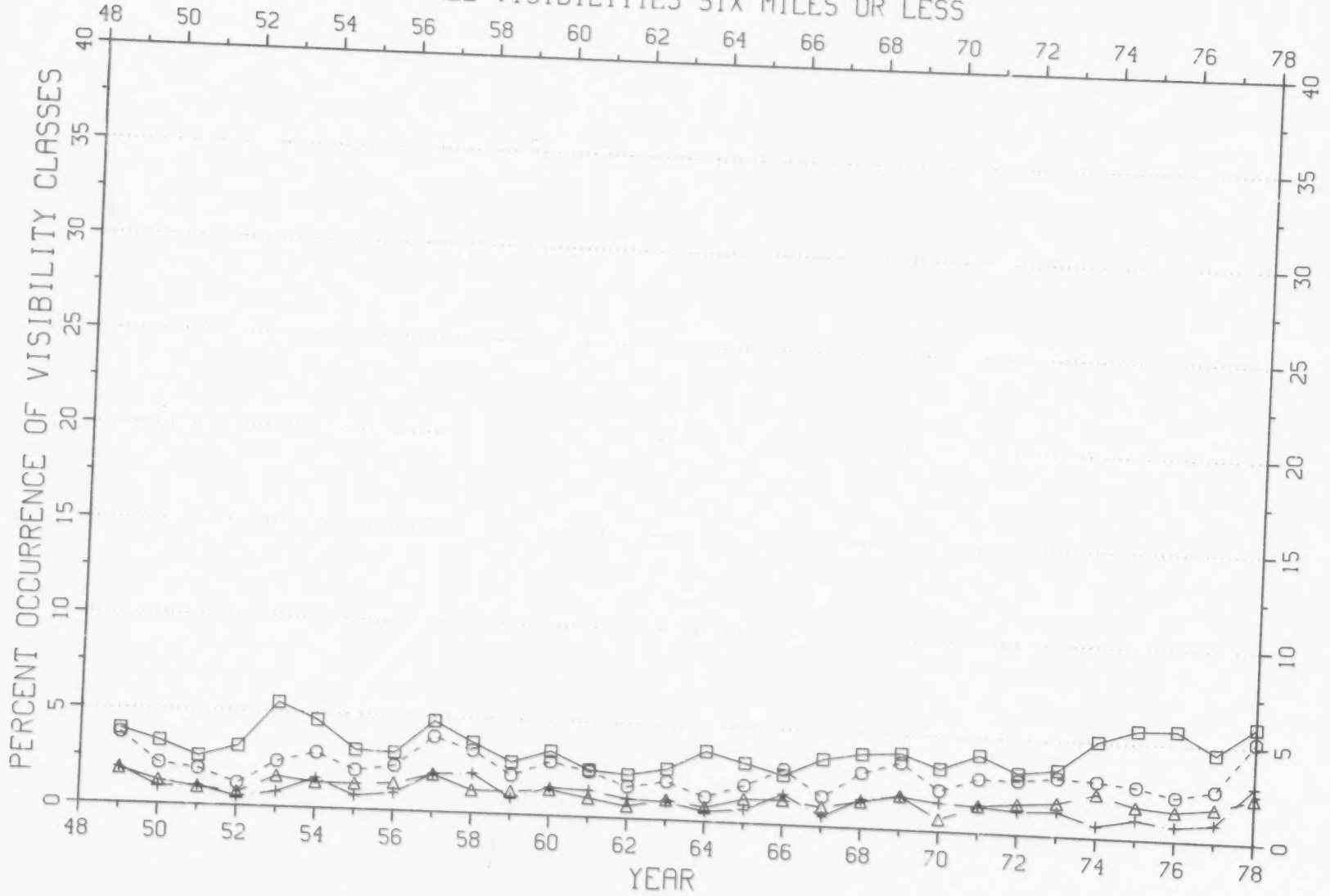
VISIBILITY TIME SERIES FOR LBB LUBBOCK, TX

ALL VISIBILITIES SIX MILES OR LESS



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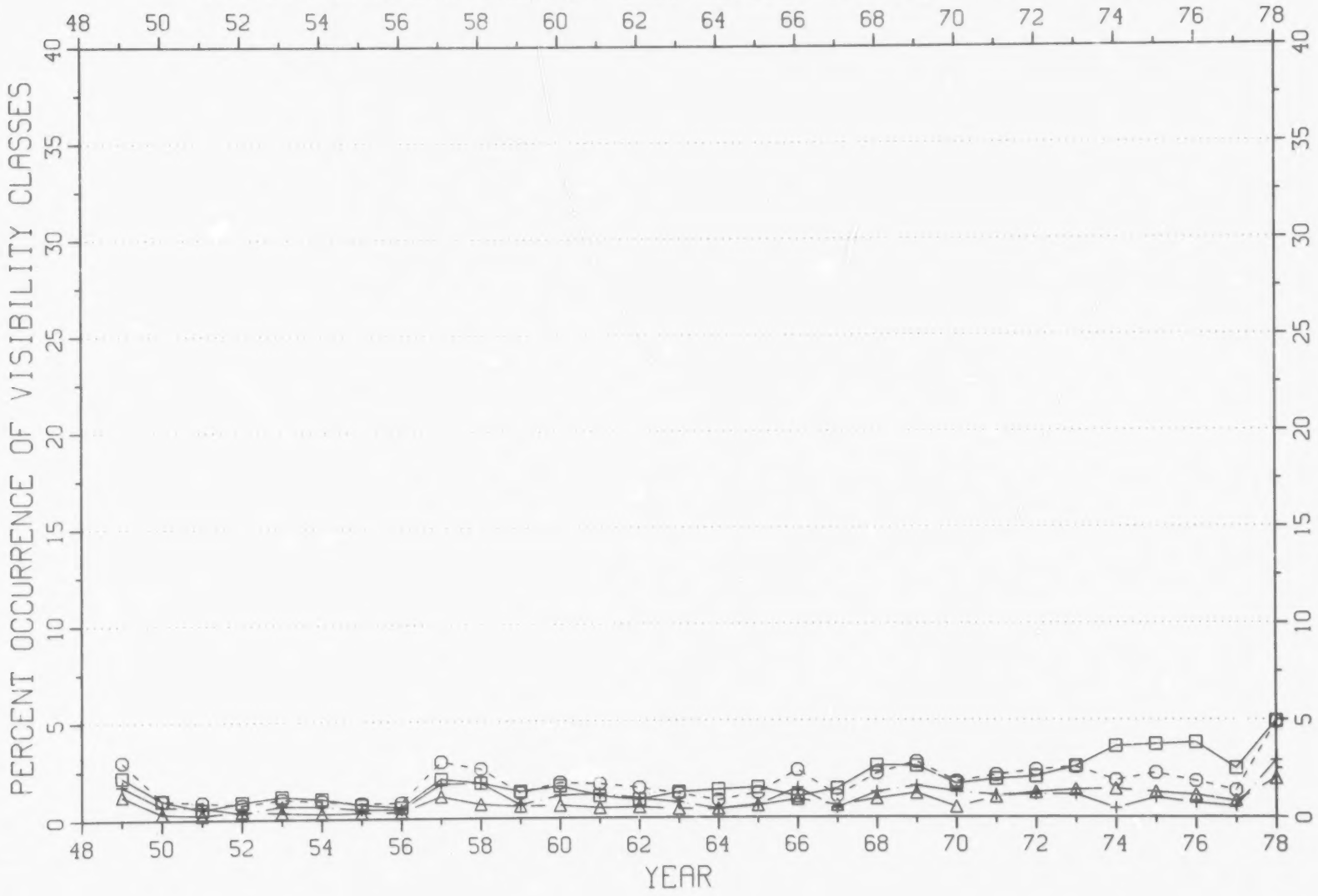
VISIBILITY TIME SERIES FOR LBB LUBBOCK, TX

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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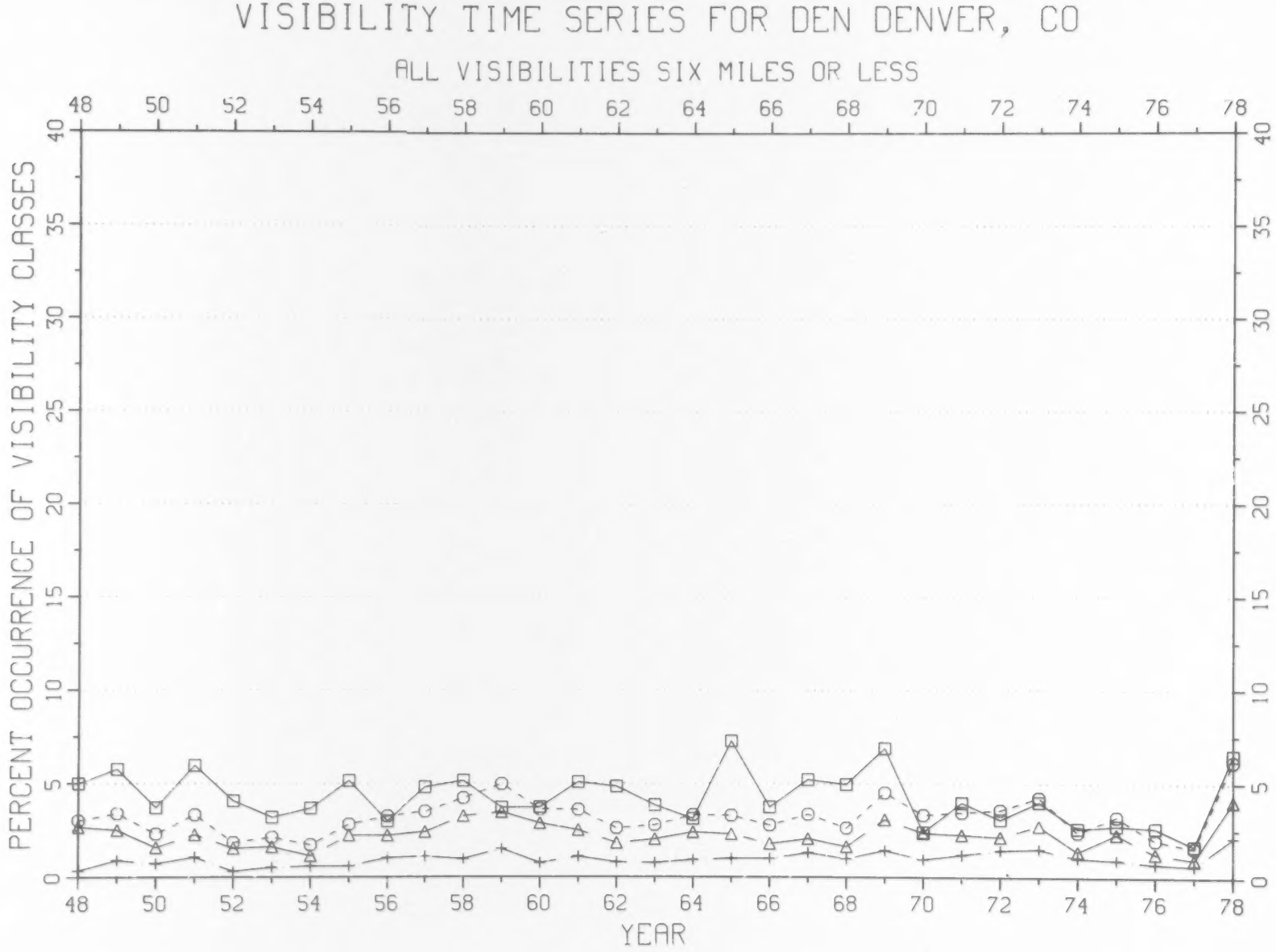

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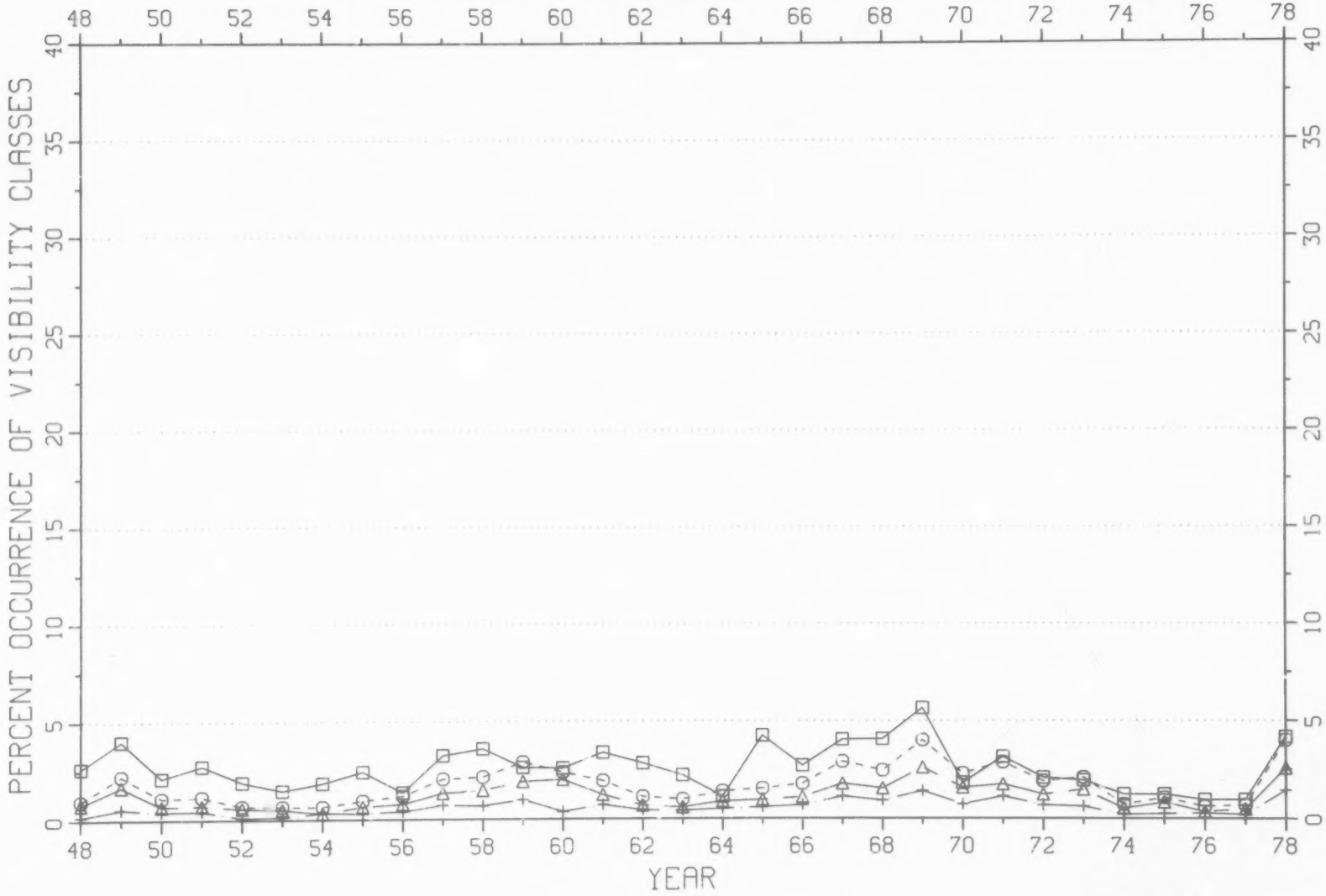
VISIBILITY TIME SERIES FOR DEN DENVER, CO

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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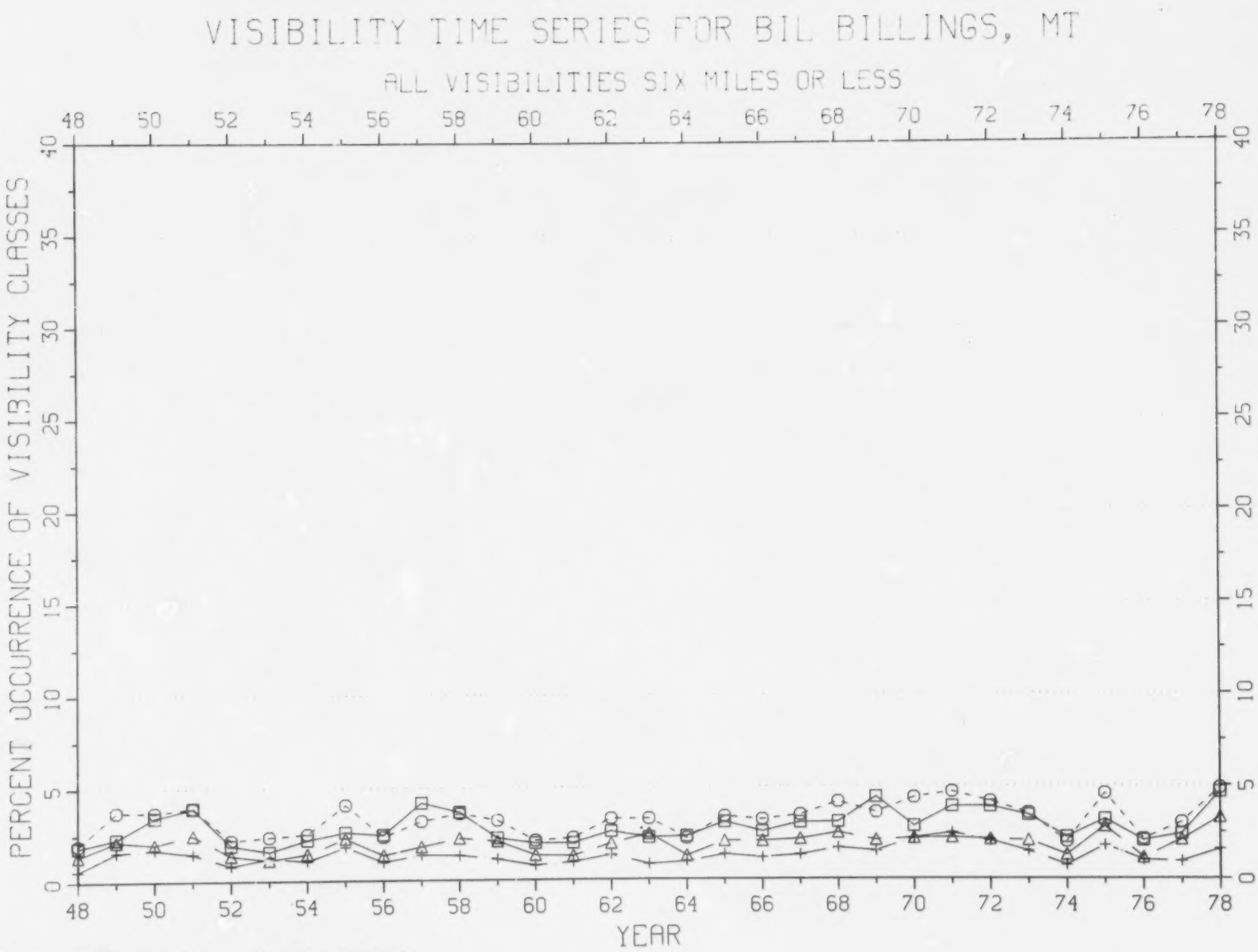

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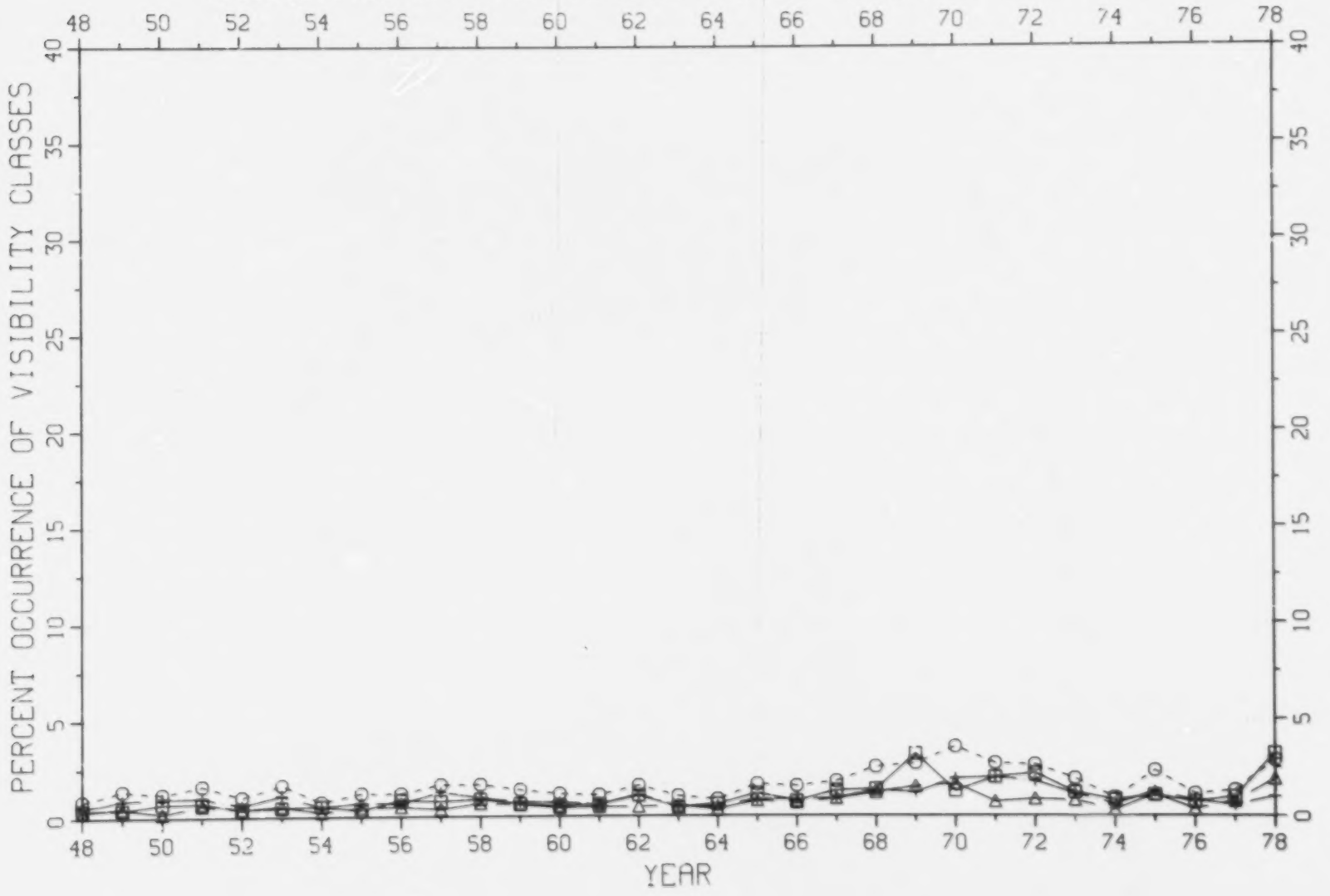
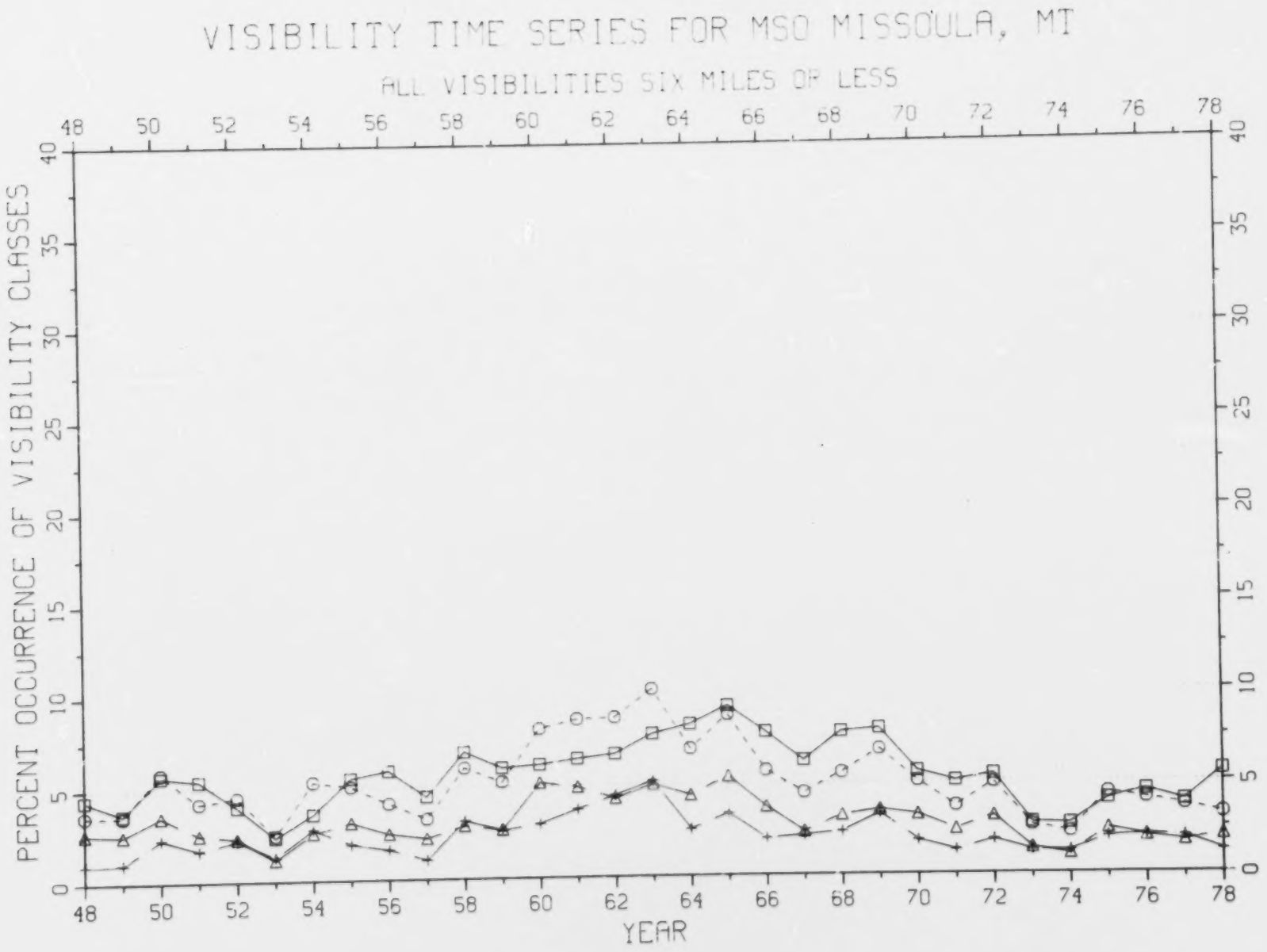

VISIBILITY TIME SERIES FOR BIL BILLINGS, MT
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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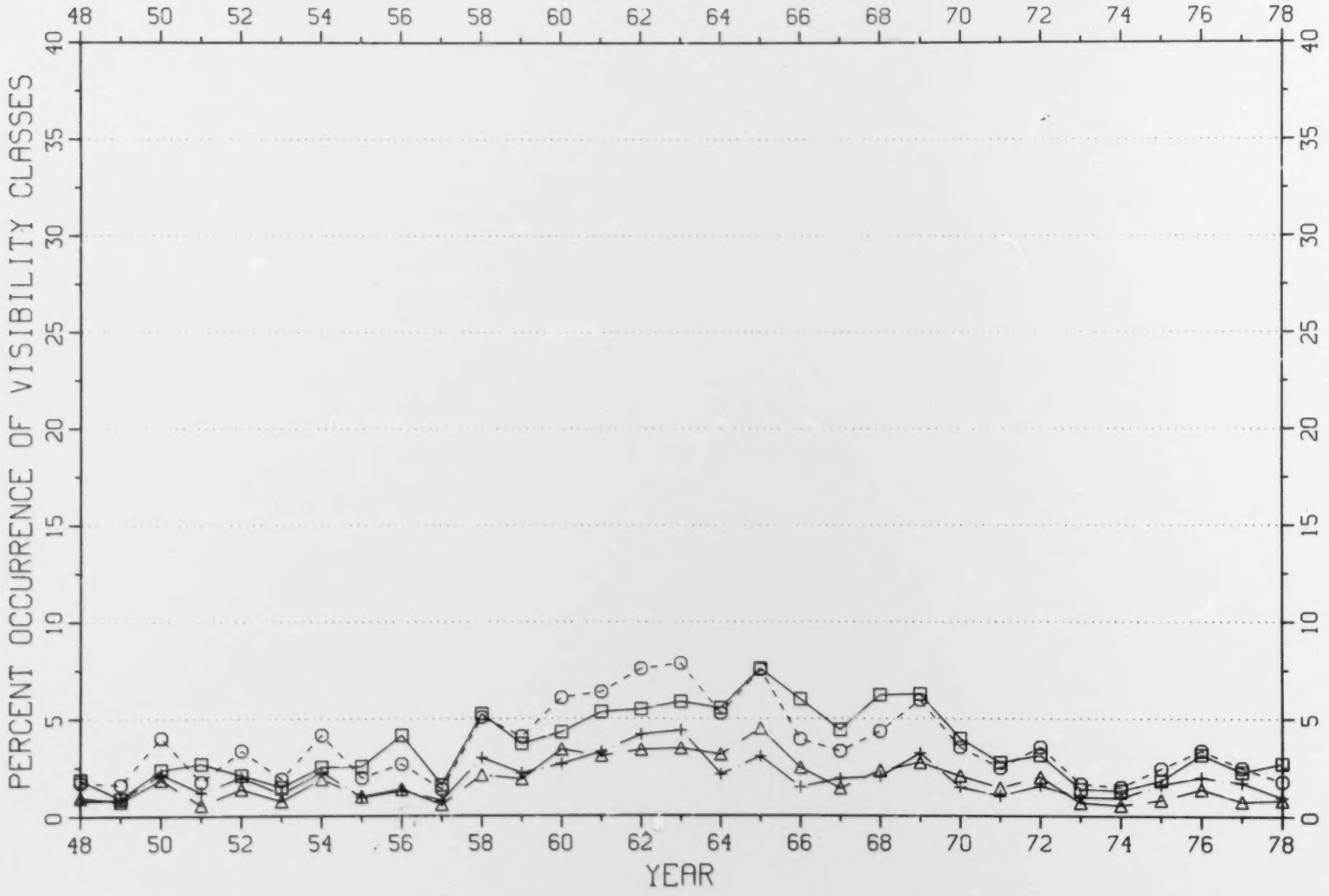
VISIBILITY TIME SERIES FOR MSO MISSOULA, MT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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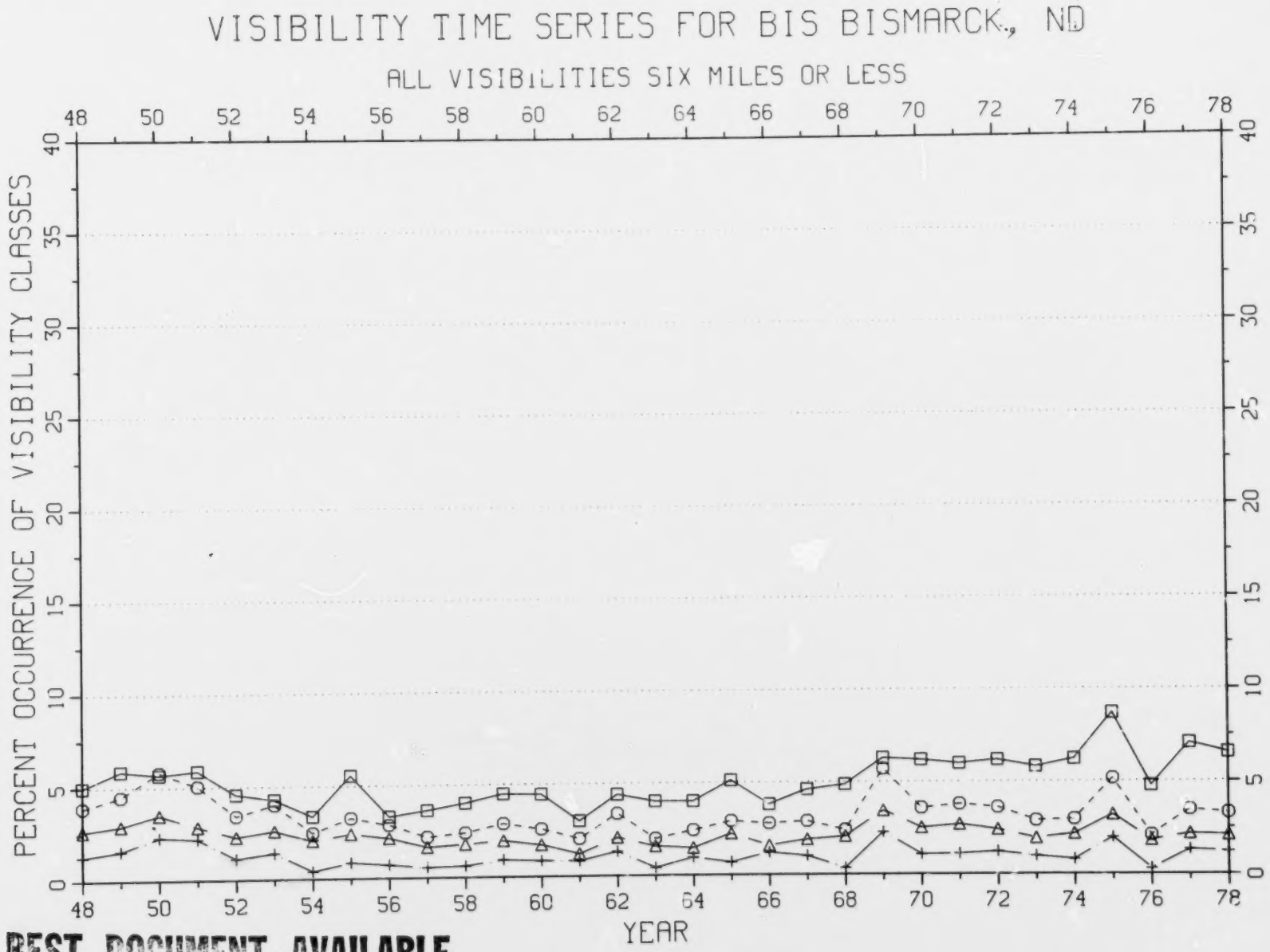
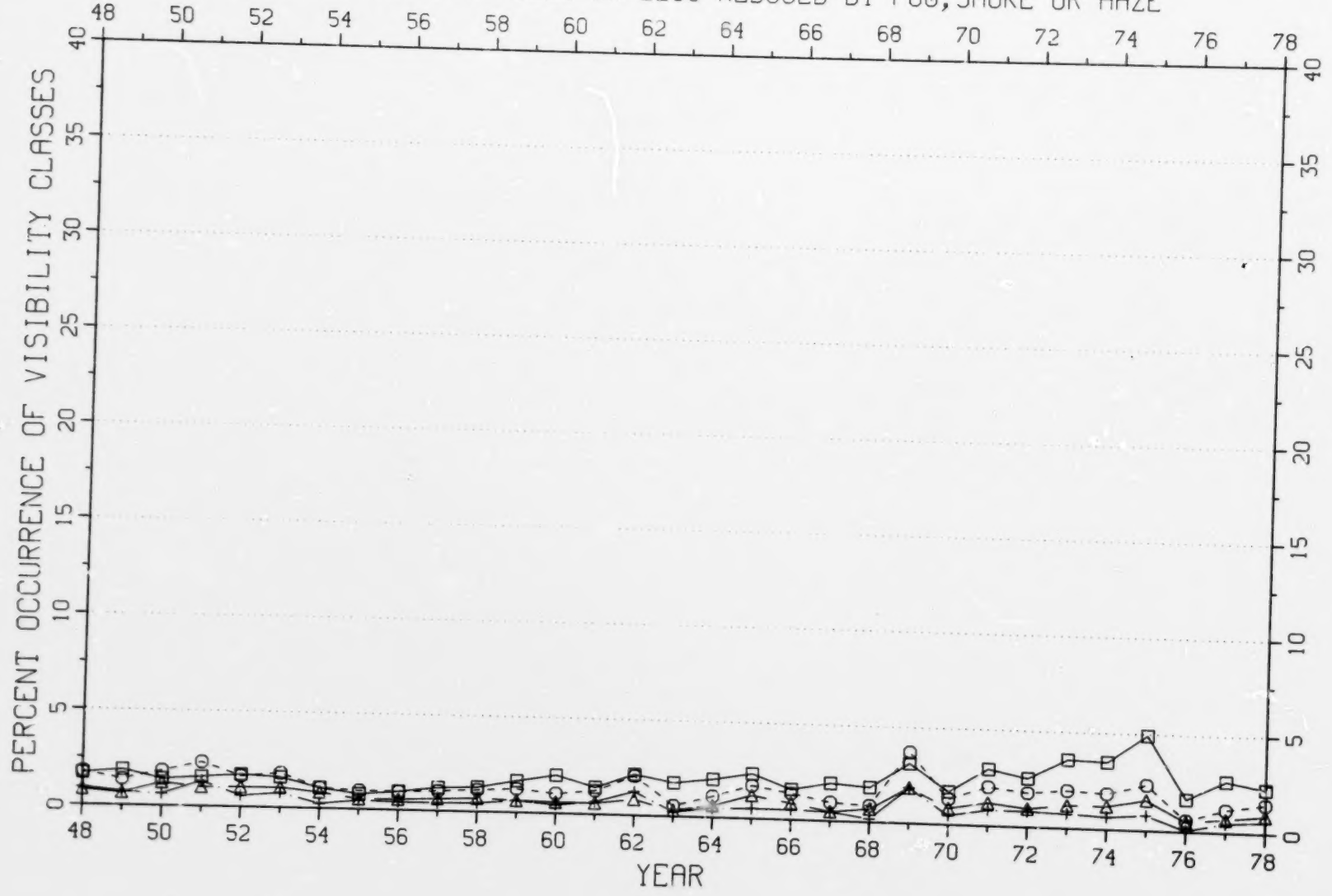

VISIBILITY TIME SERIES FOR BIS BISMARCK., ND
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR BIS BISMARCK, ND

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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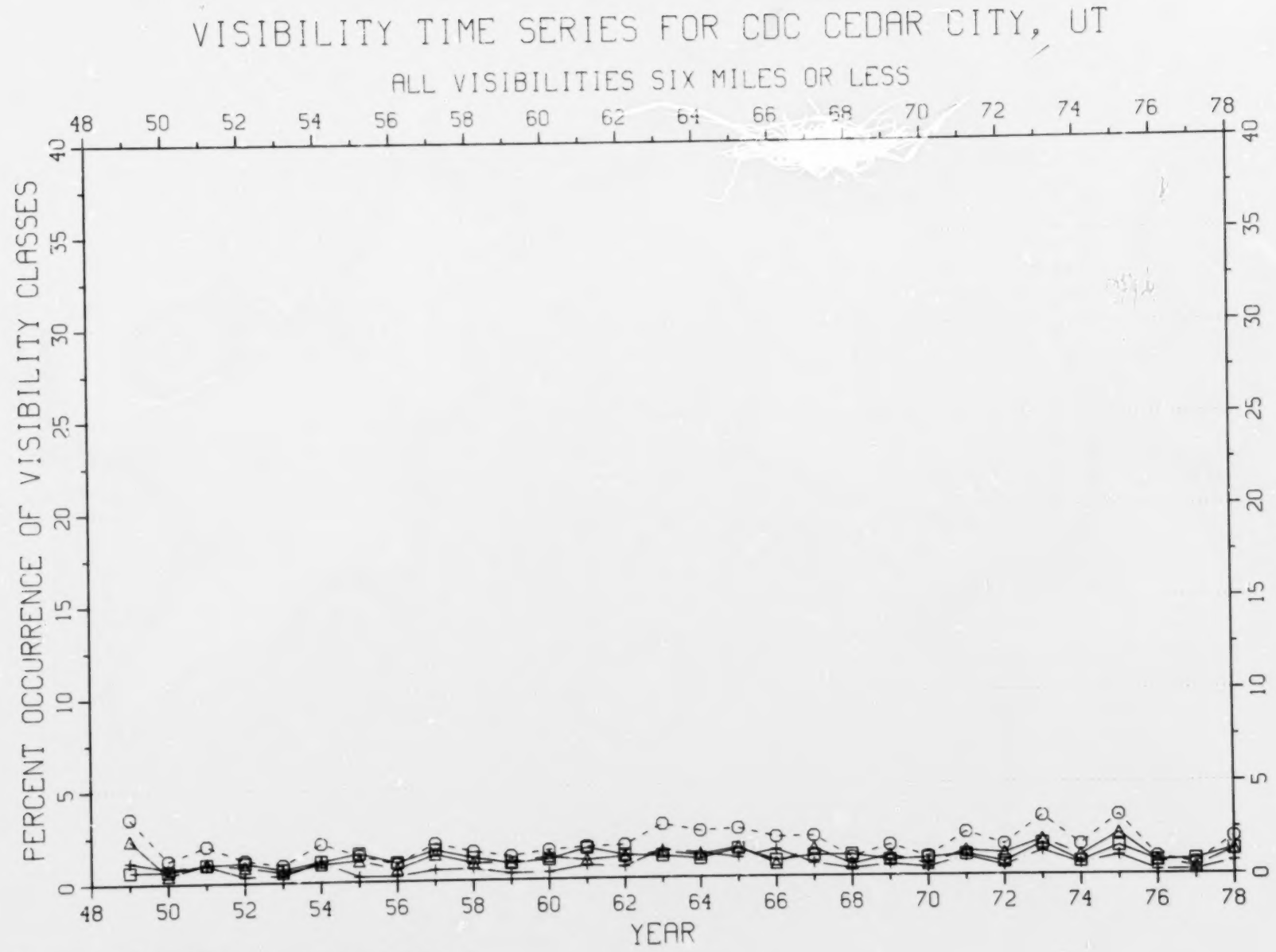

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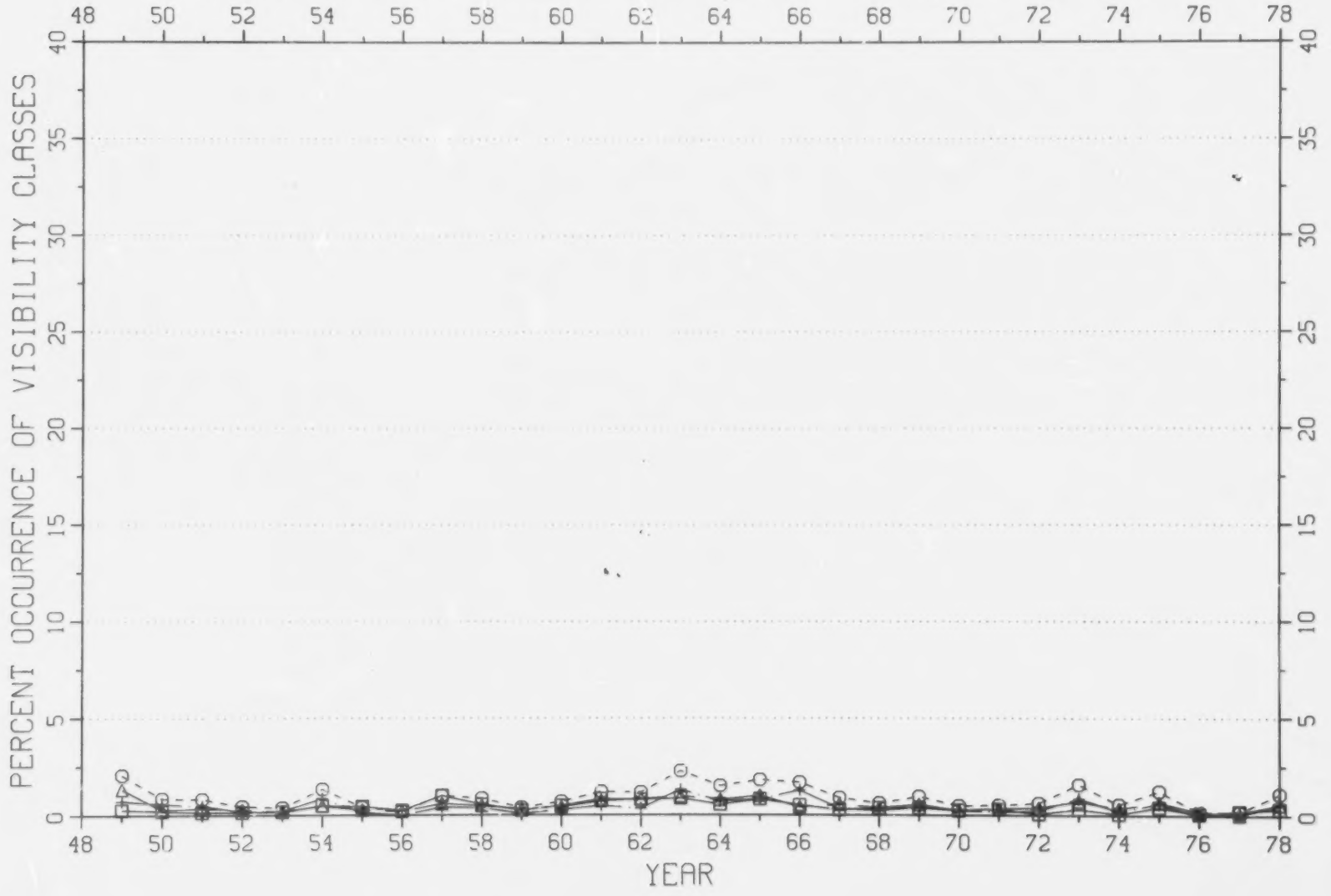
VISIBILITY TIME SERIES FOR CDC CEDAR CITY, UT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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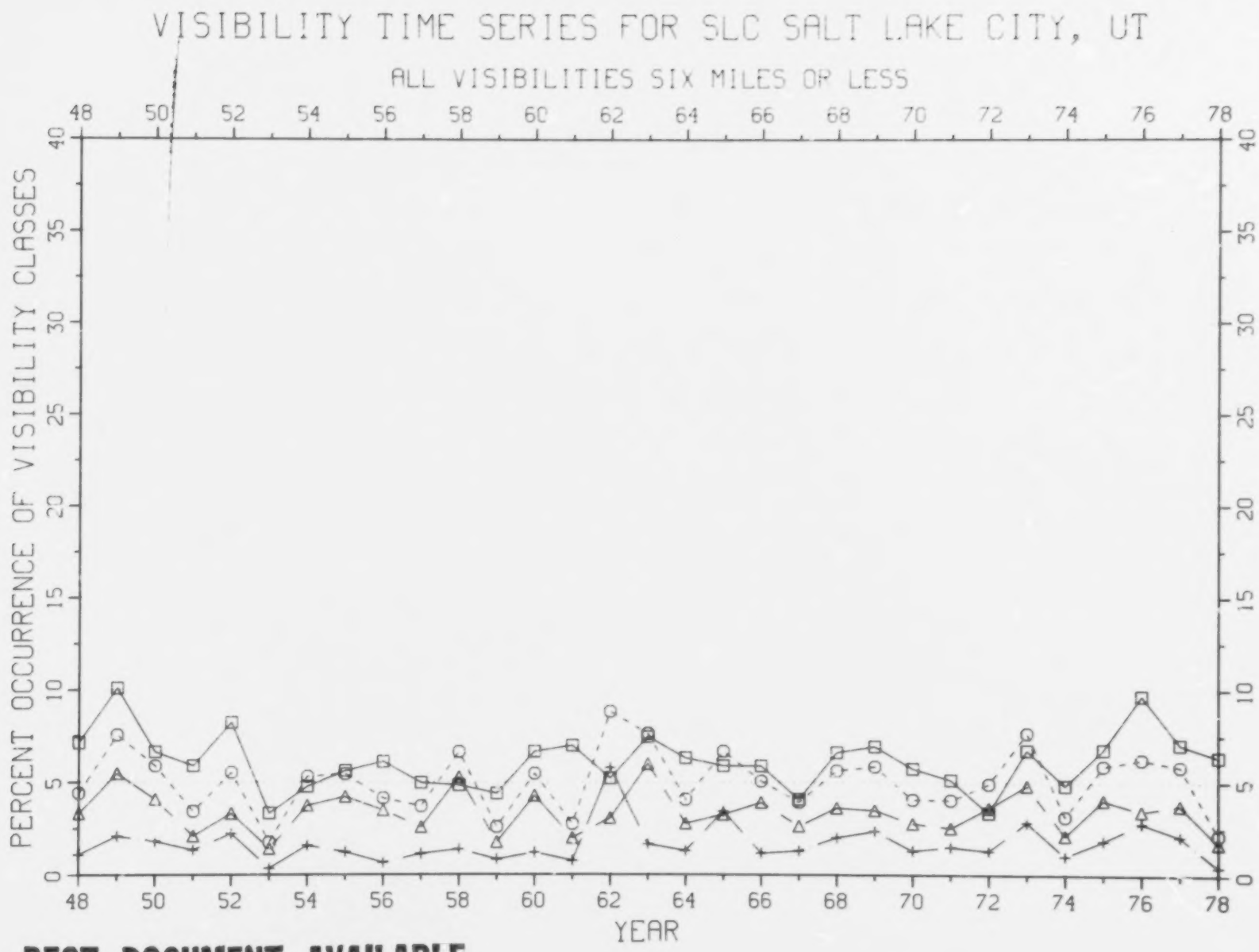

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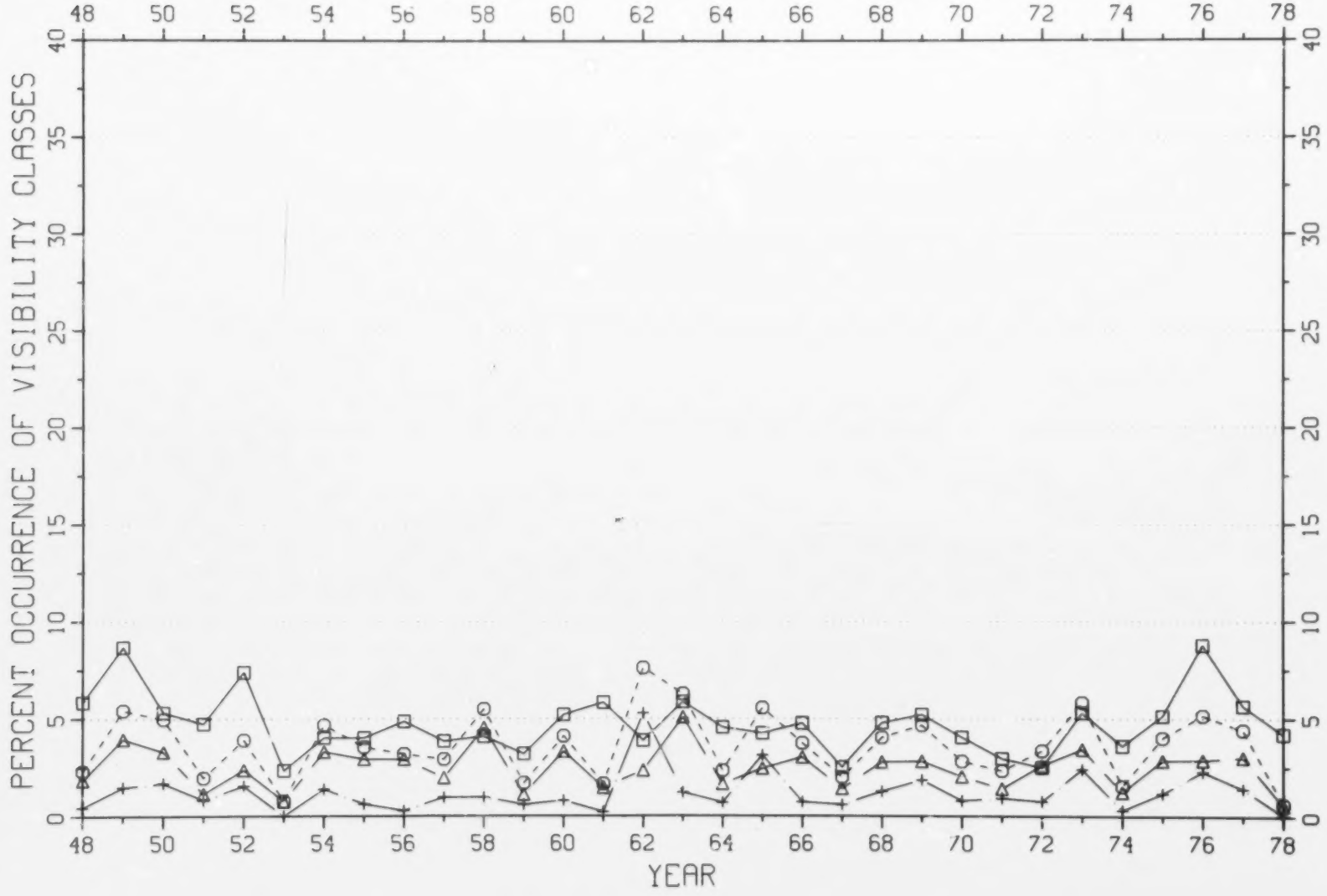
VISIBILITY TIME SERIES FOR SLC SALT LAKE CITY, UT

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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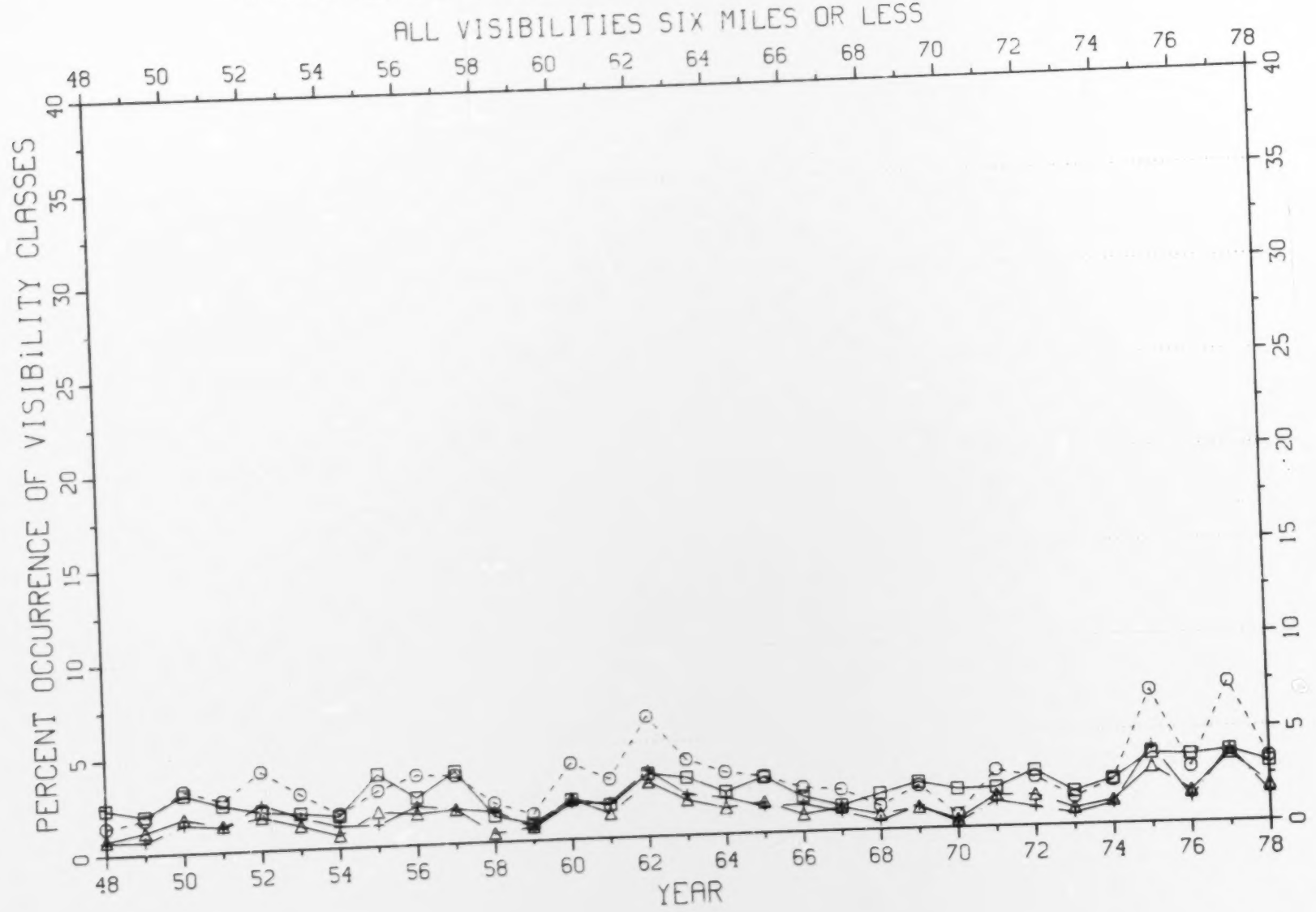
VISIBILITY TIME SERIES FOR BOI BOISE, ID



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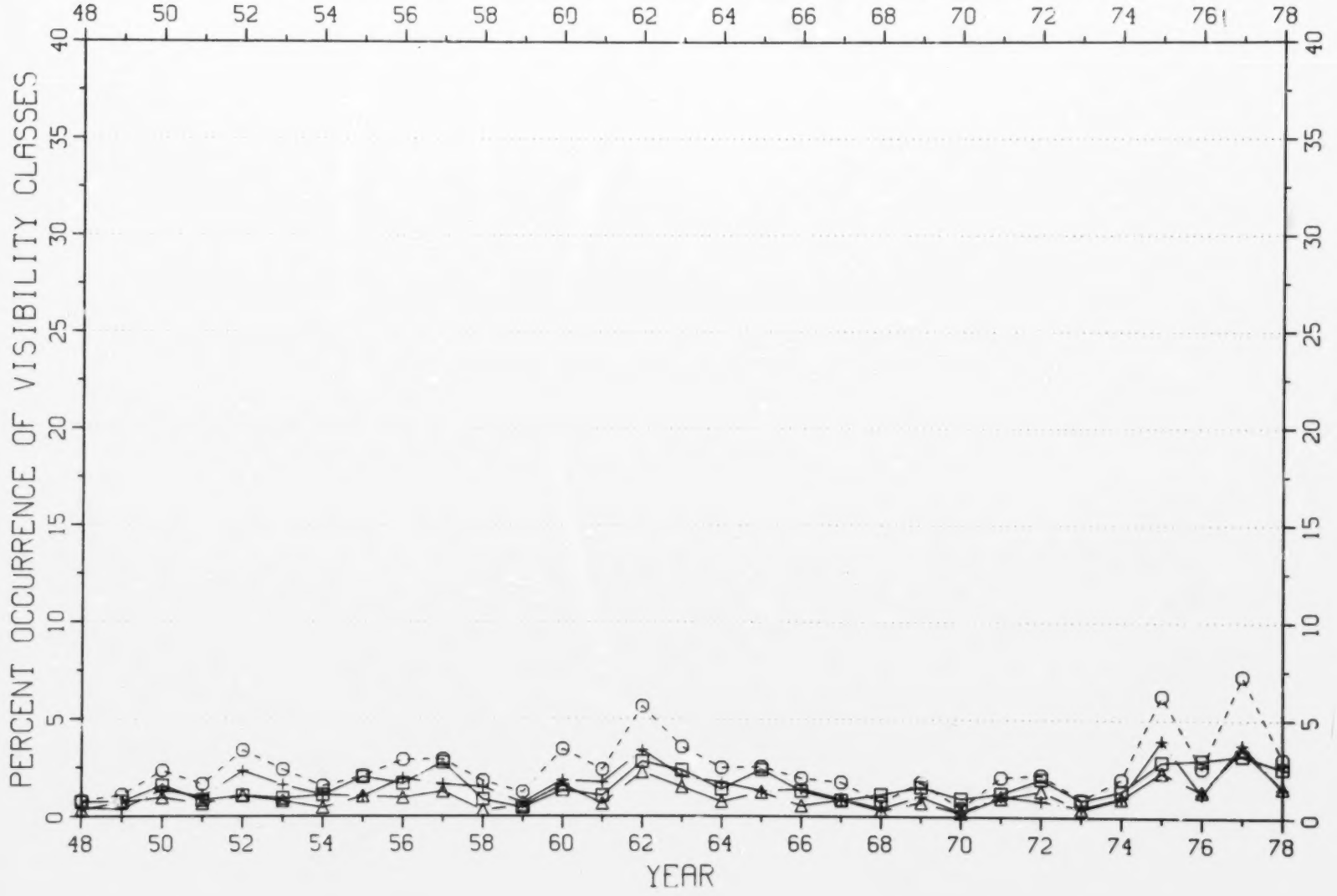
VISIBILITY TIME SERIES FOR BOI BOISE, ID

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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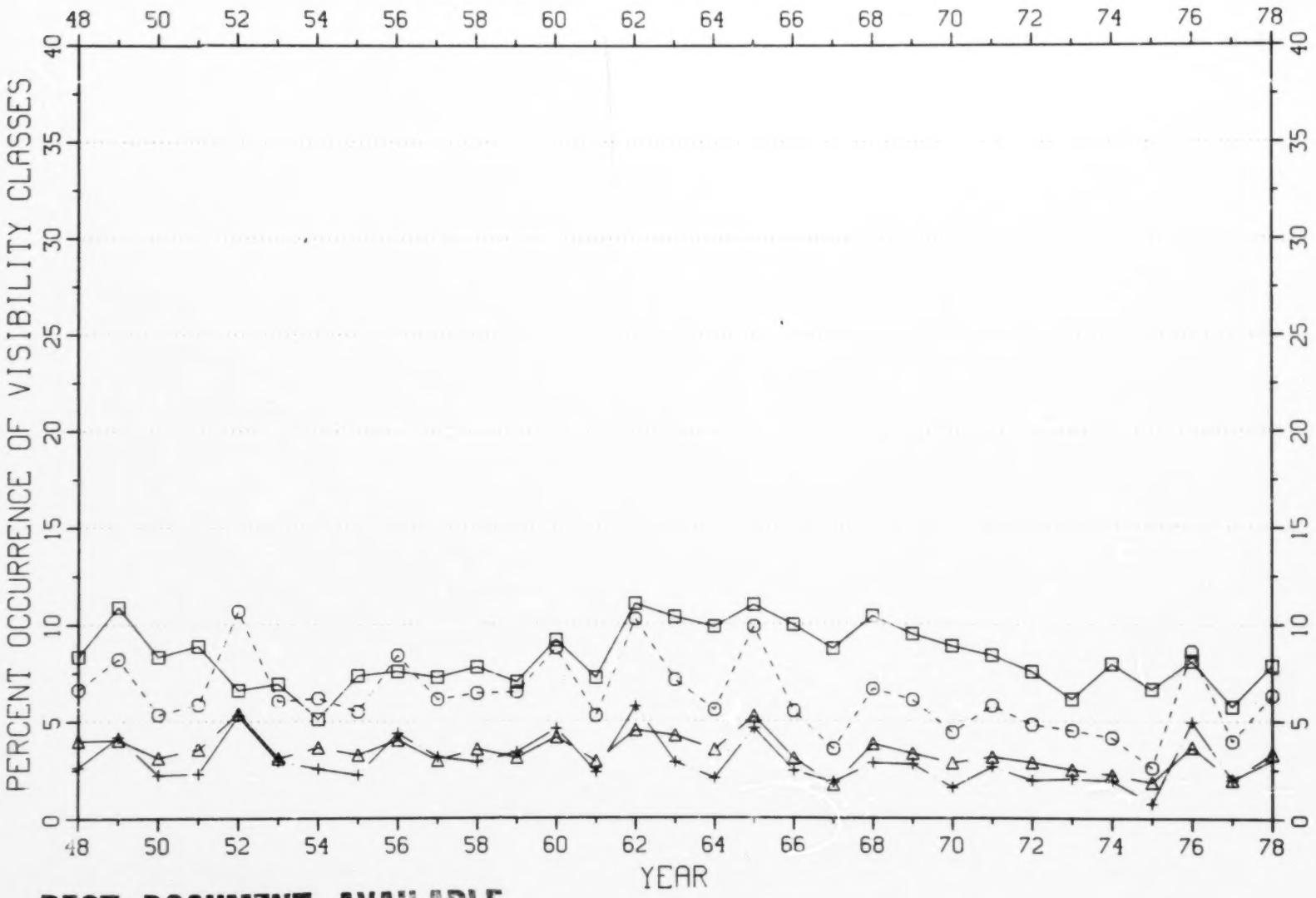
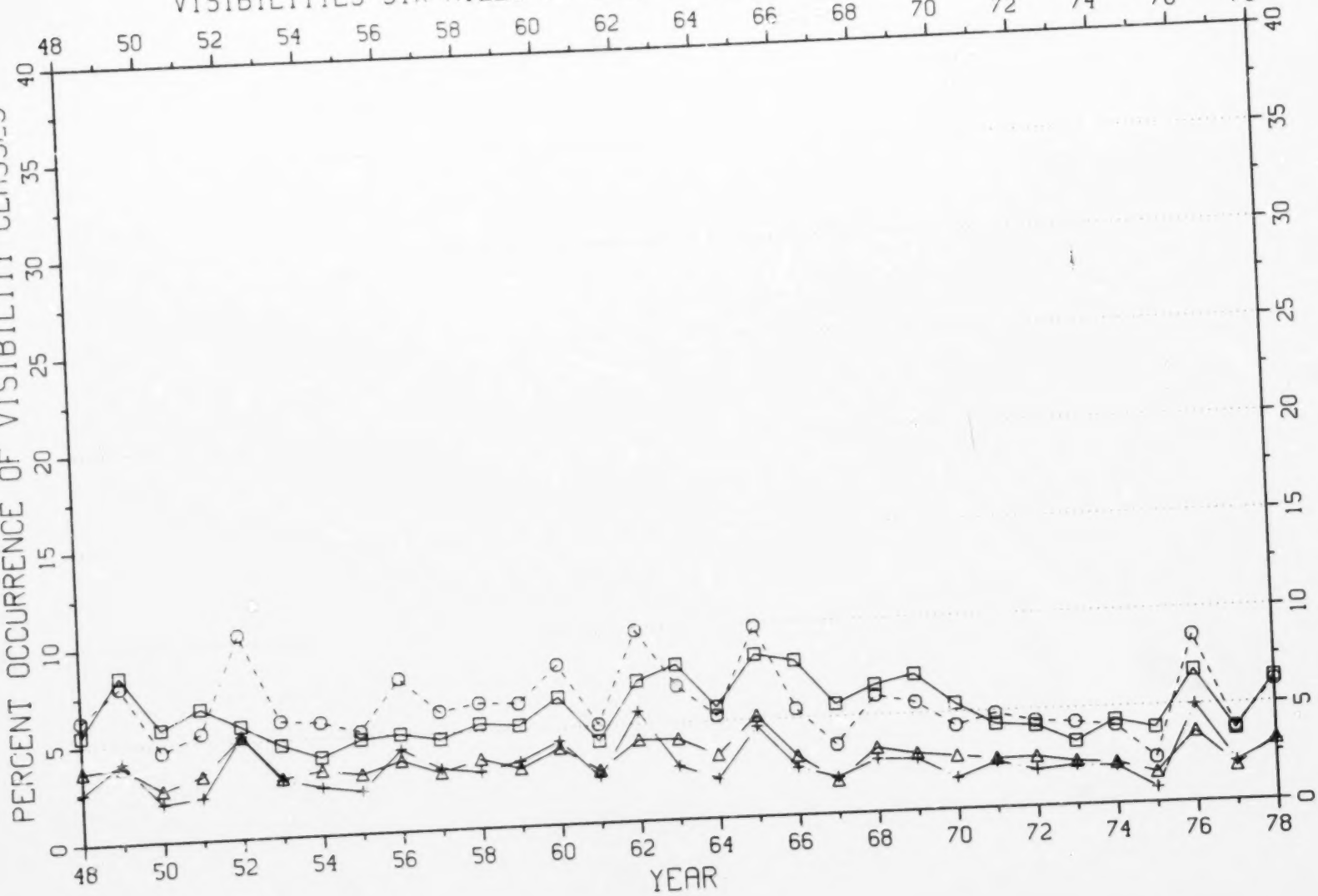

VISIBILITY TIME SERIES FOR SLE SALEM, OR
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR SLE SALEM, OR

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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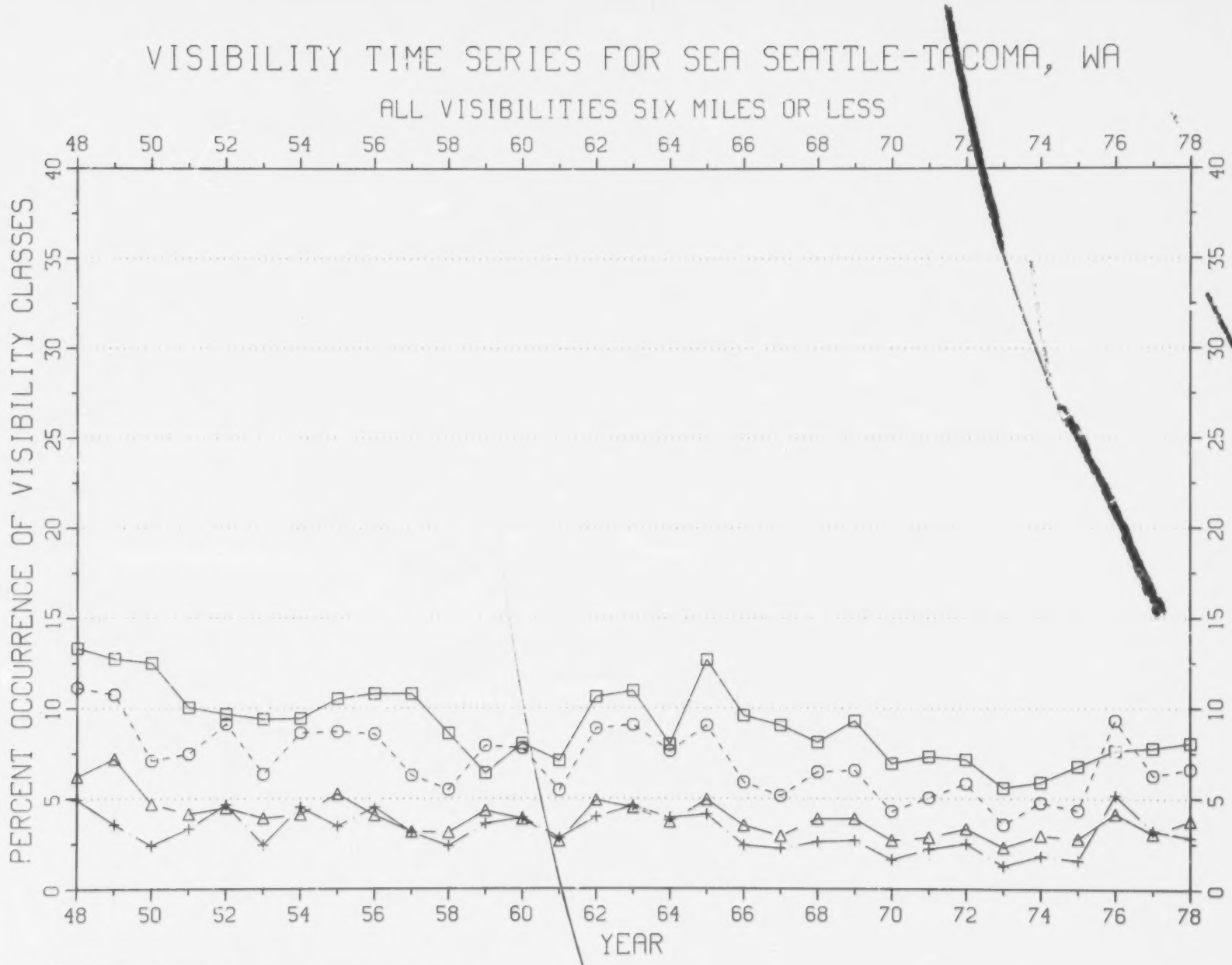

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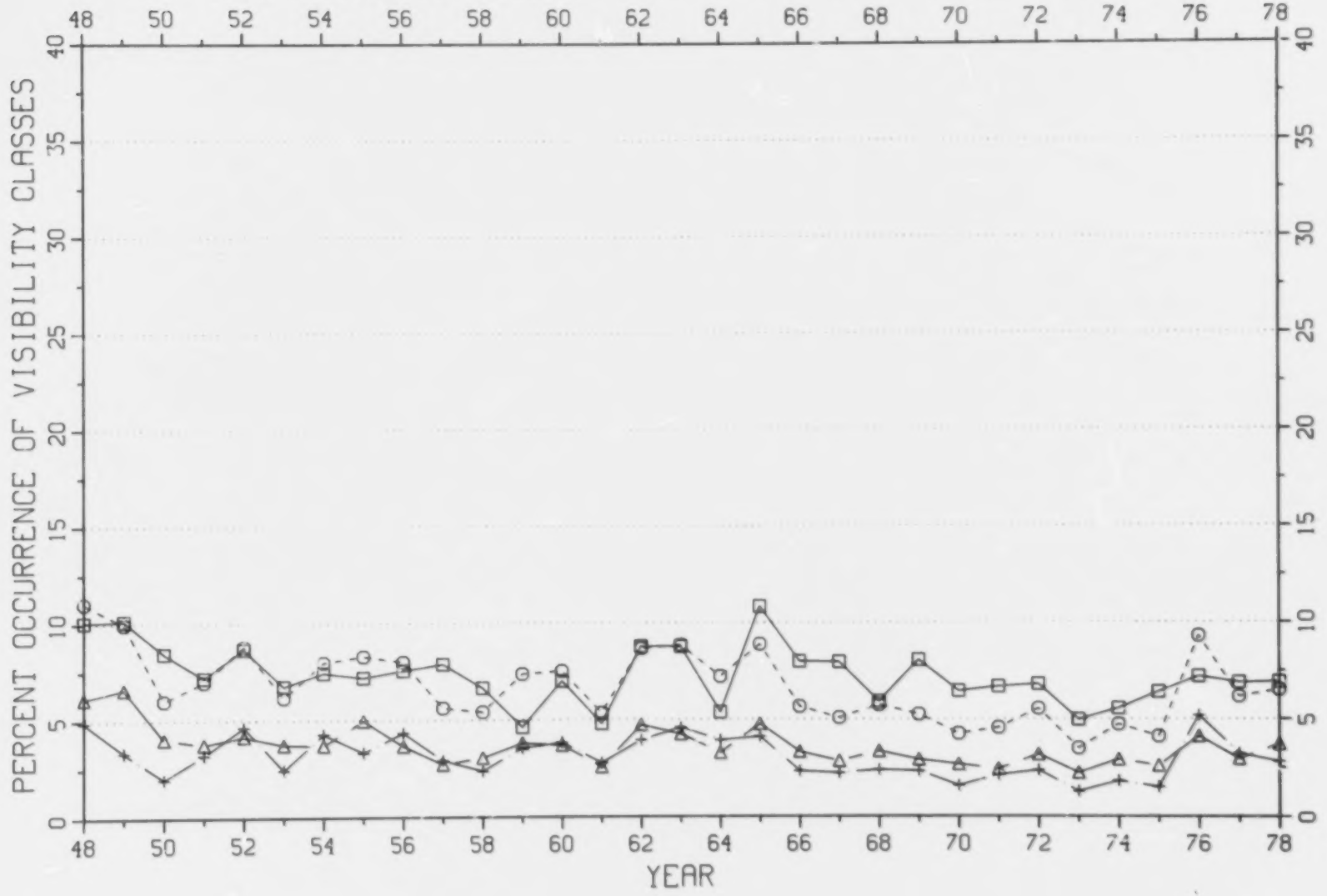
VISIBILITY TIME SERIES FOR SEA SEATTLE-TACOMA, WA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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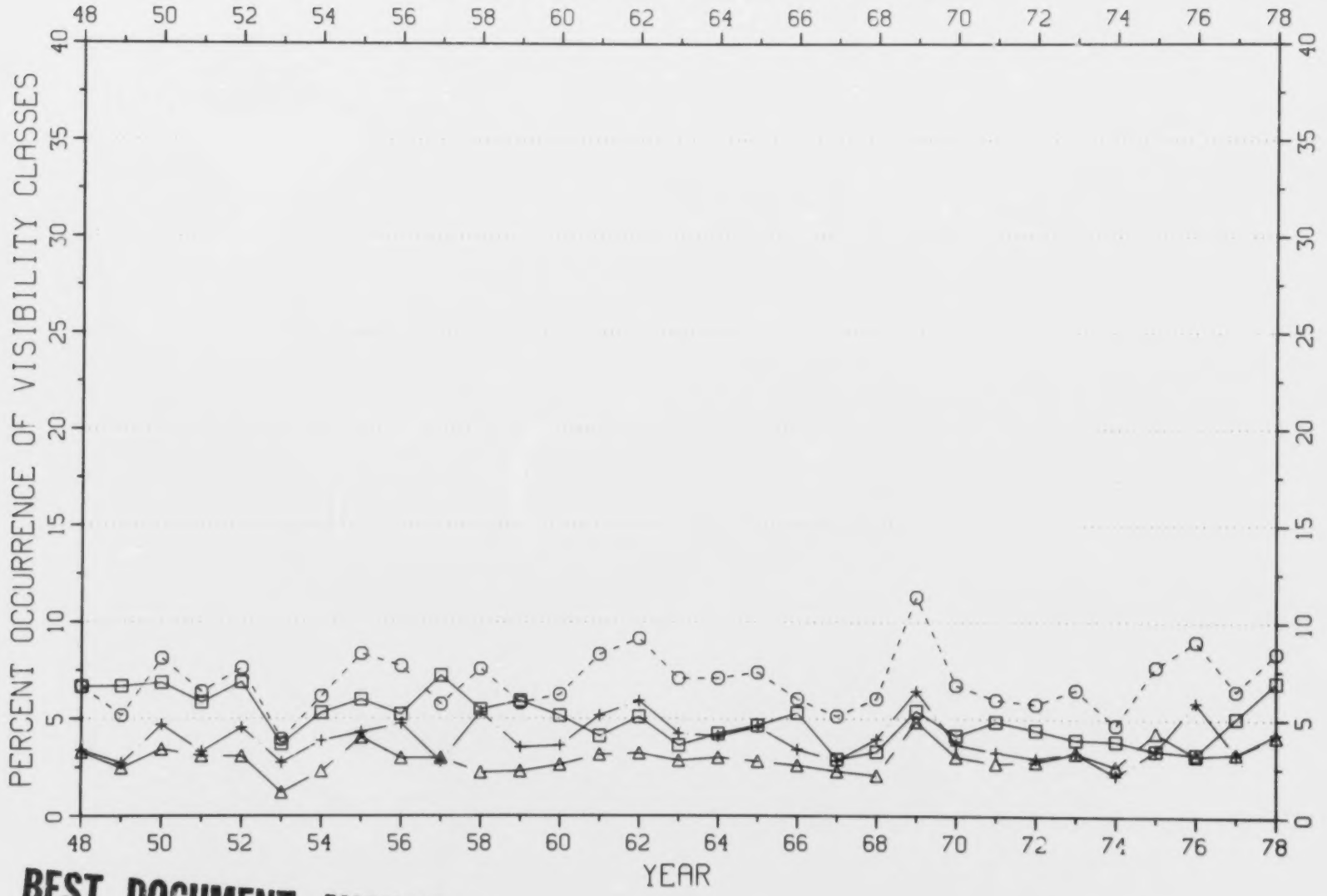
VISIBILITY TIME SERIES FOR GEG SPOKANE, WA



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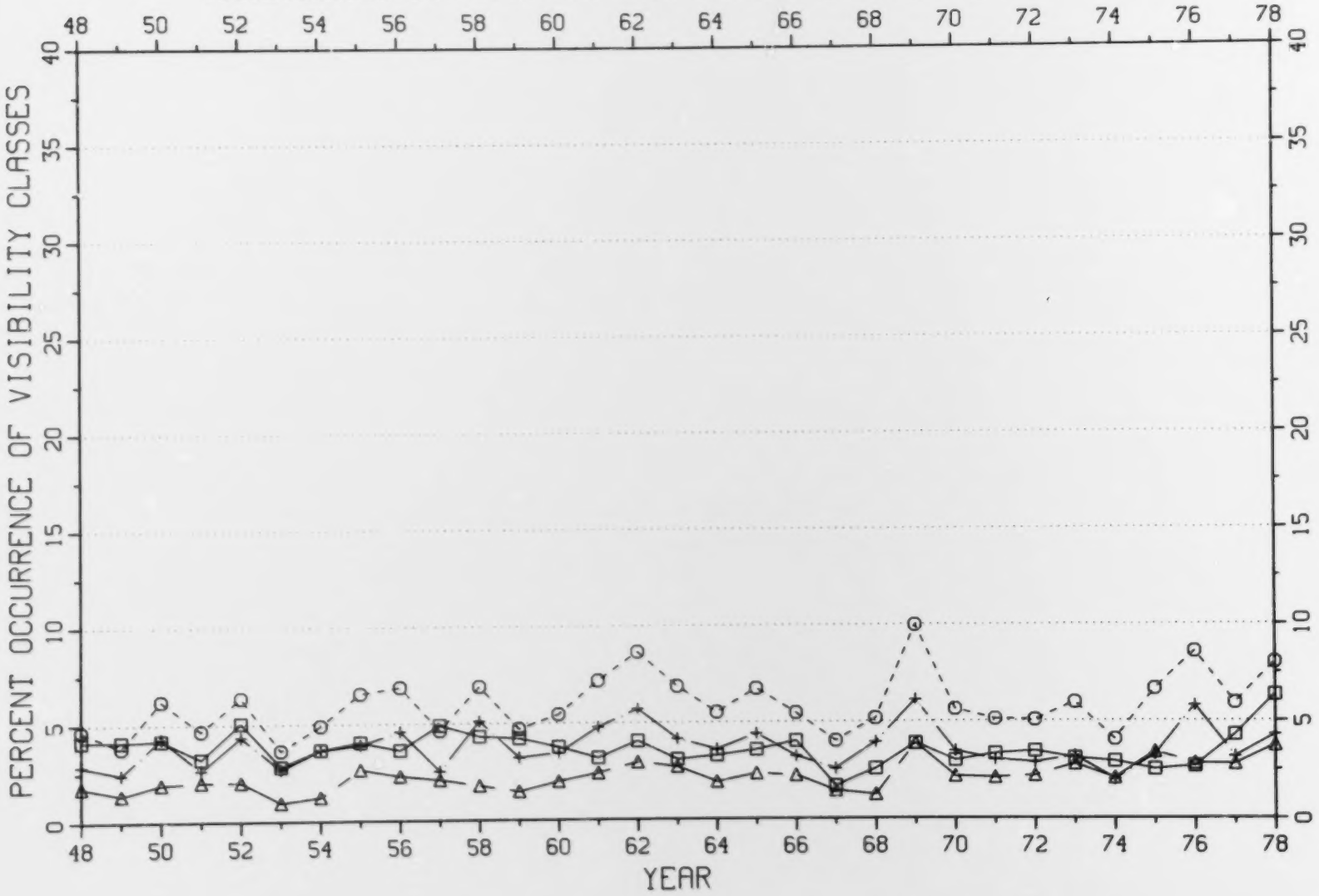
VISIBILITY TIME SERIES FOR GEG SPOKANE, WA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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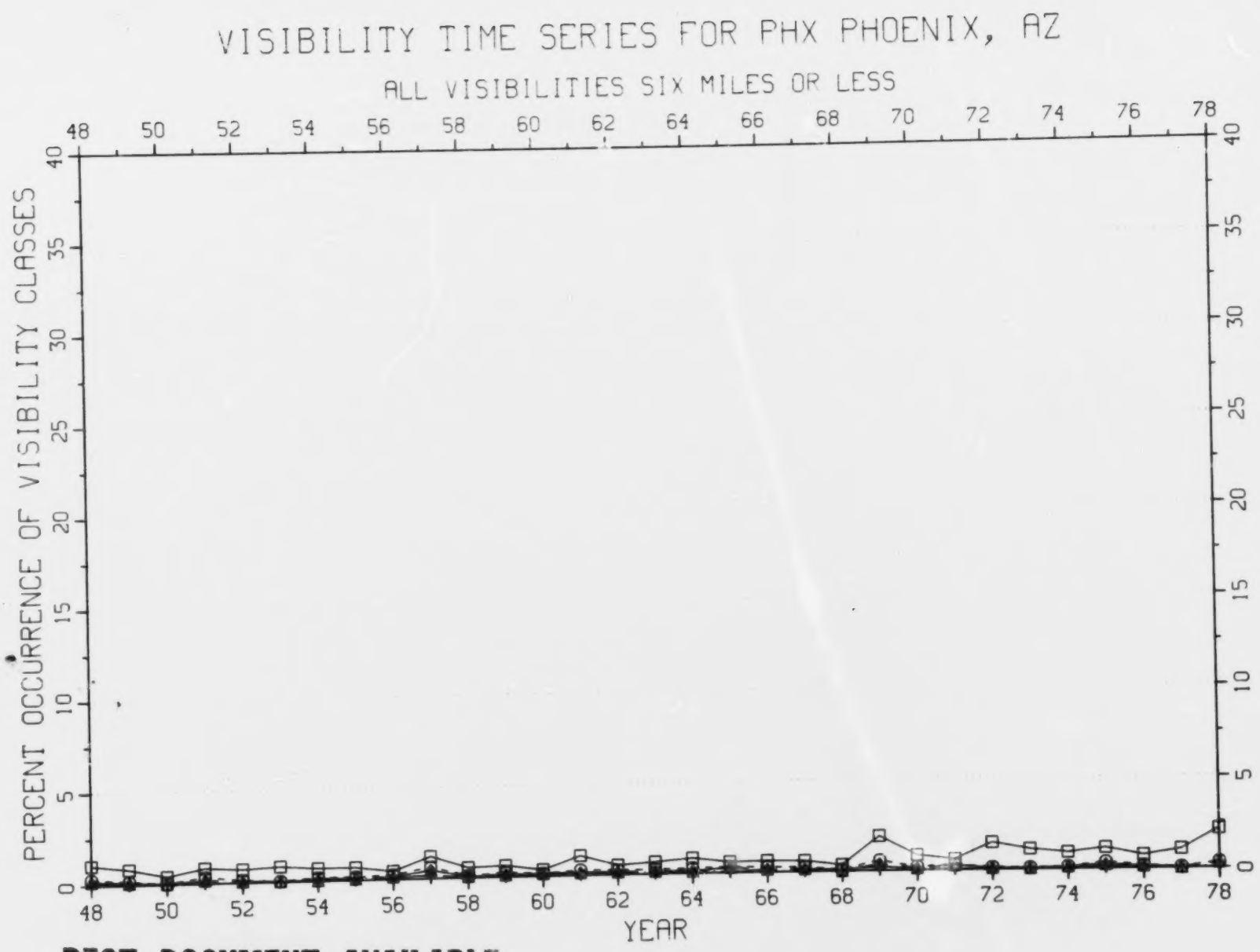
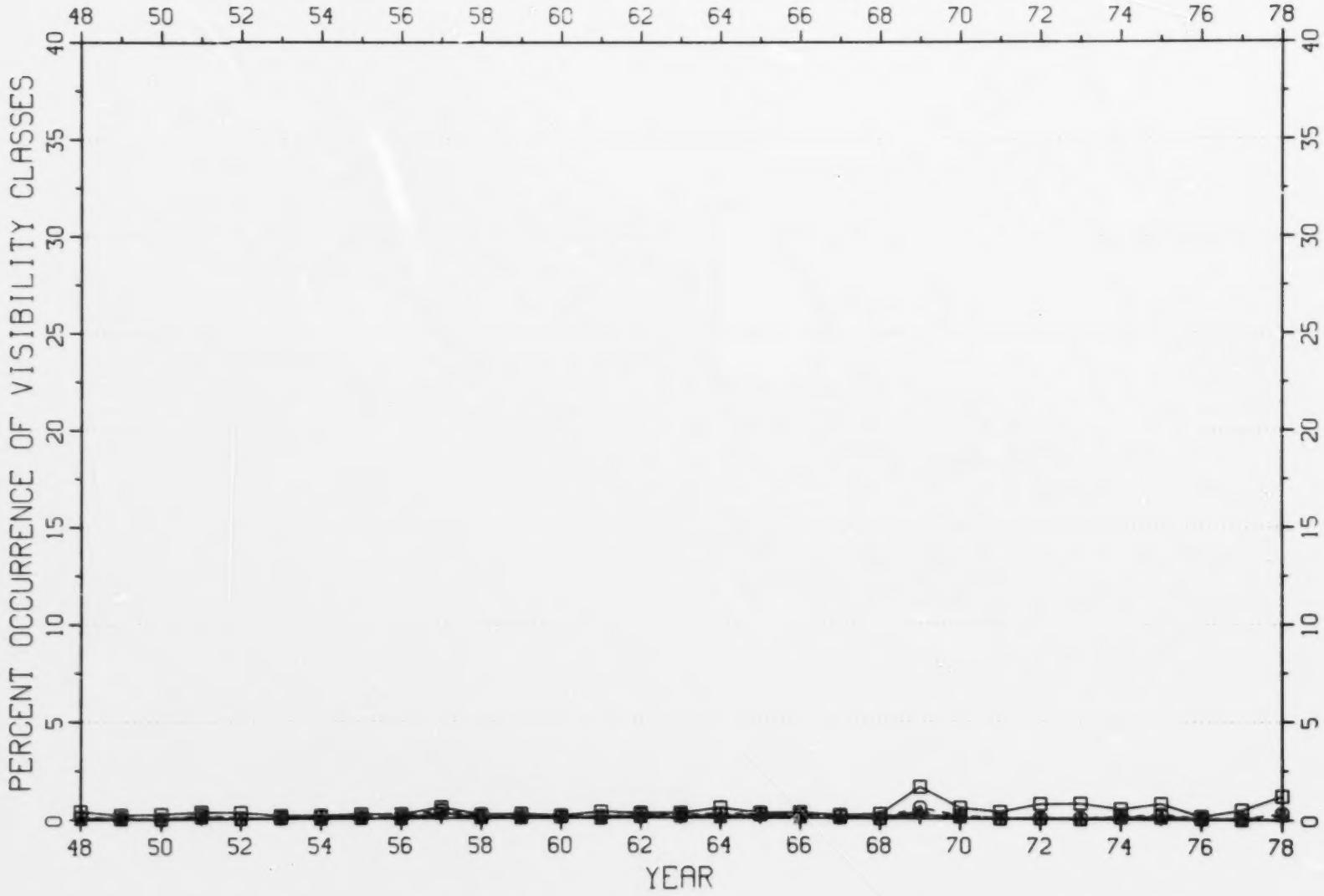

VISIBILITY TIME SERIES FOR PHX PHOENIX, AZ
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR PHX PHOENIX, AZ

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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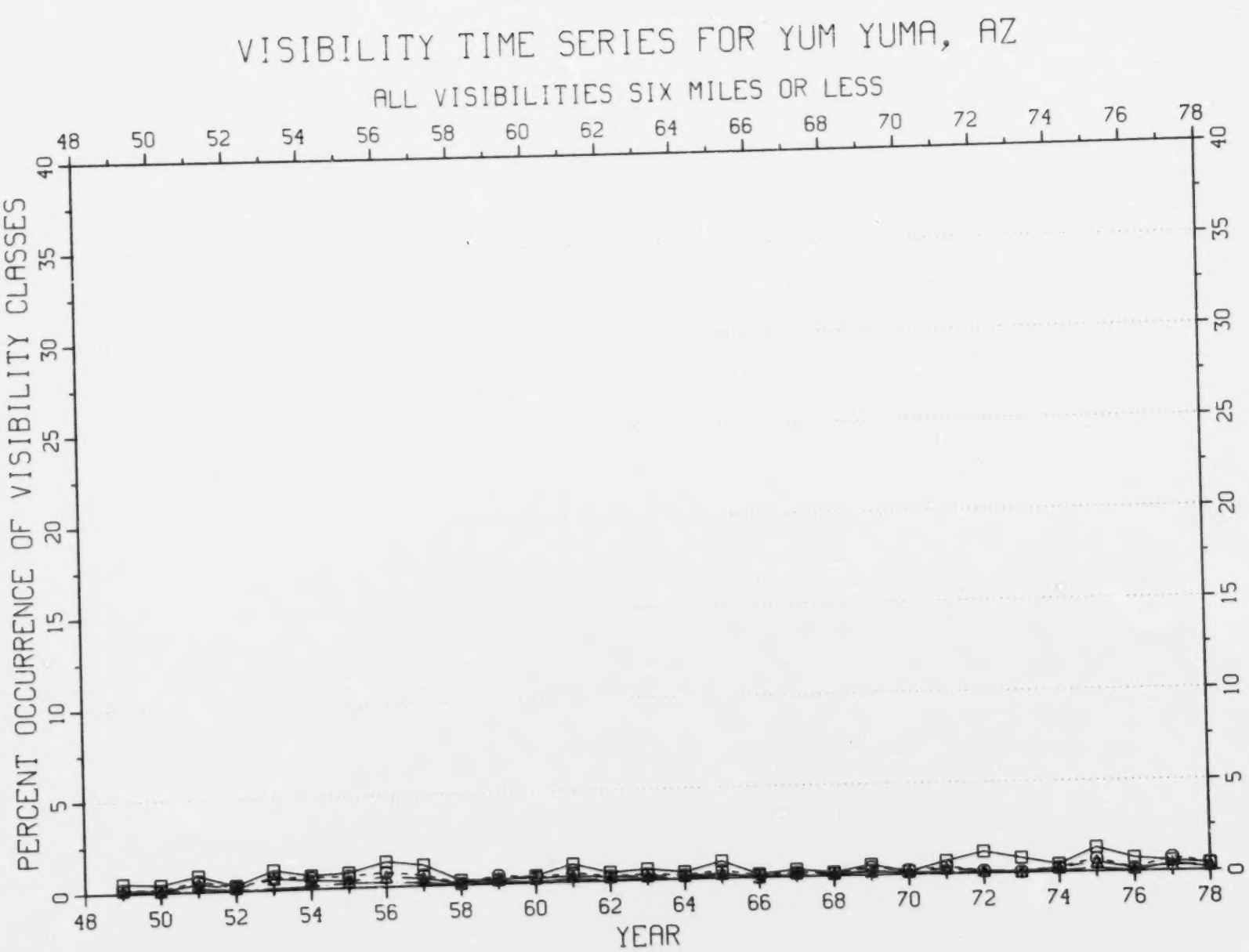

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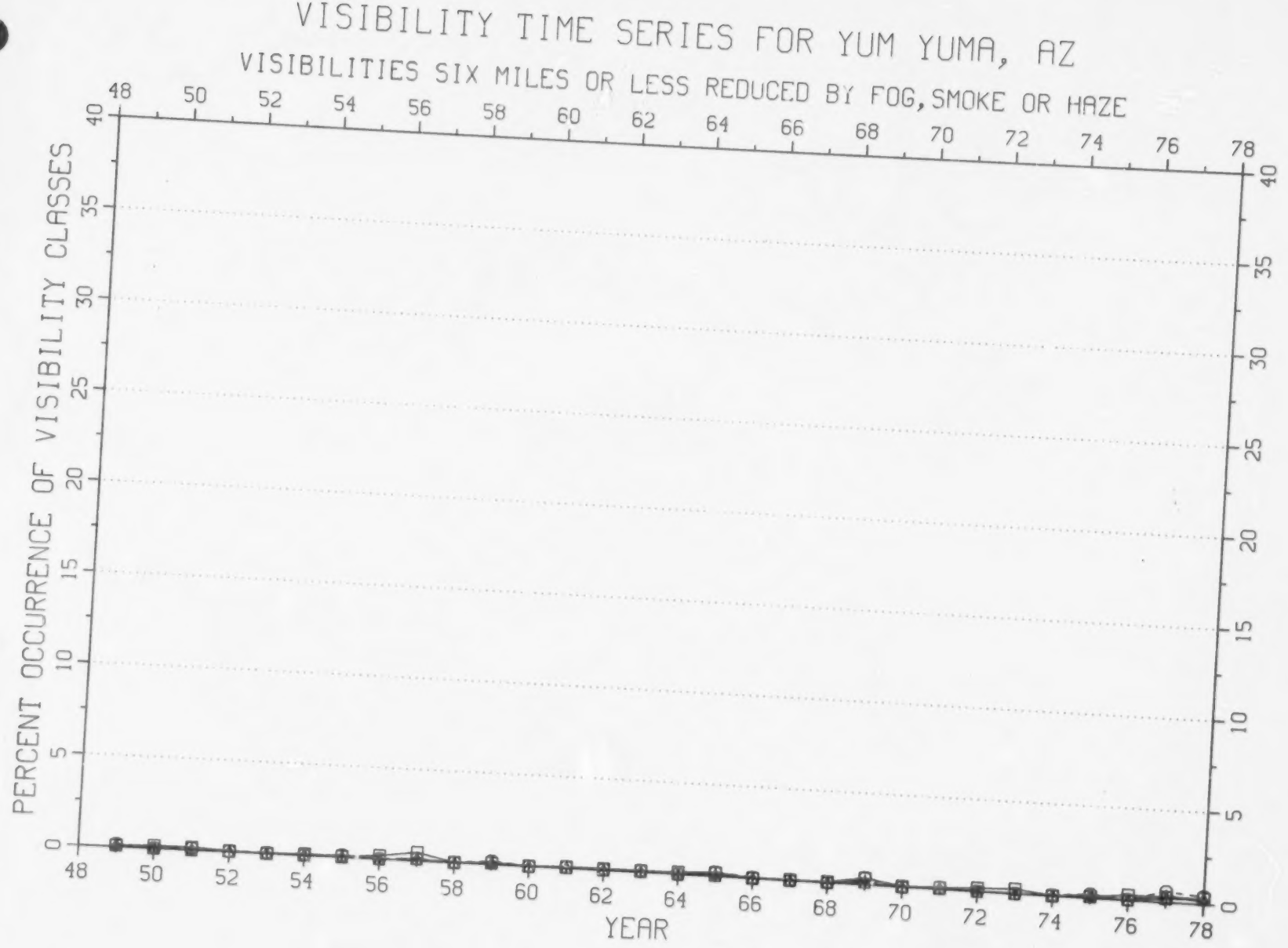

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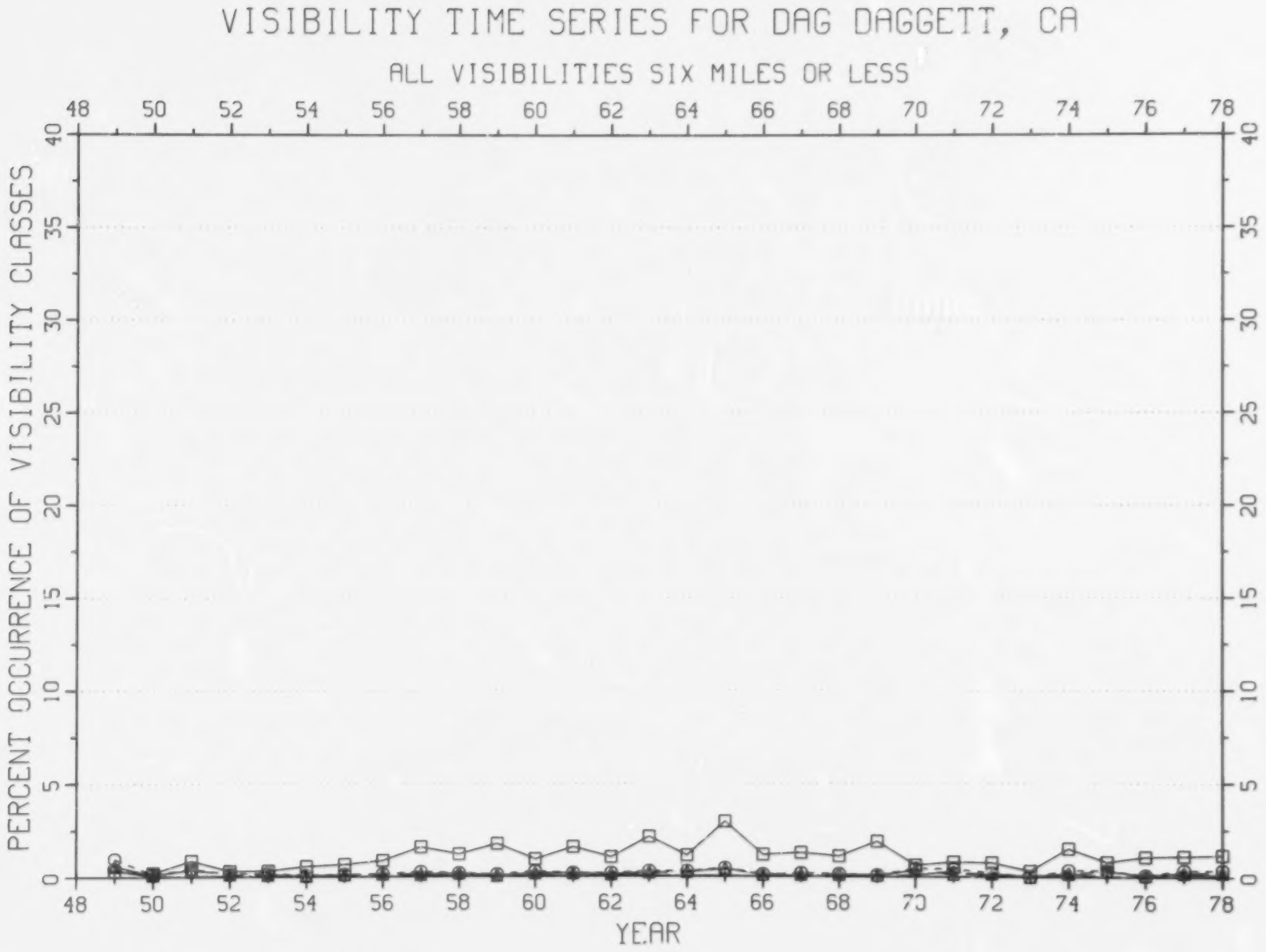
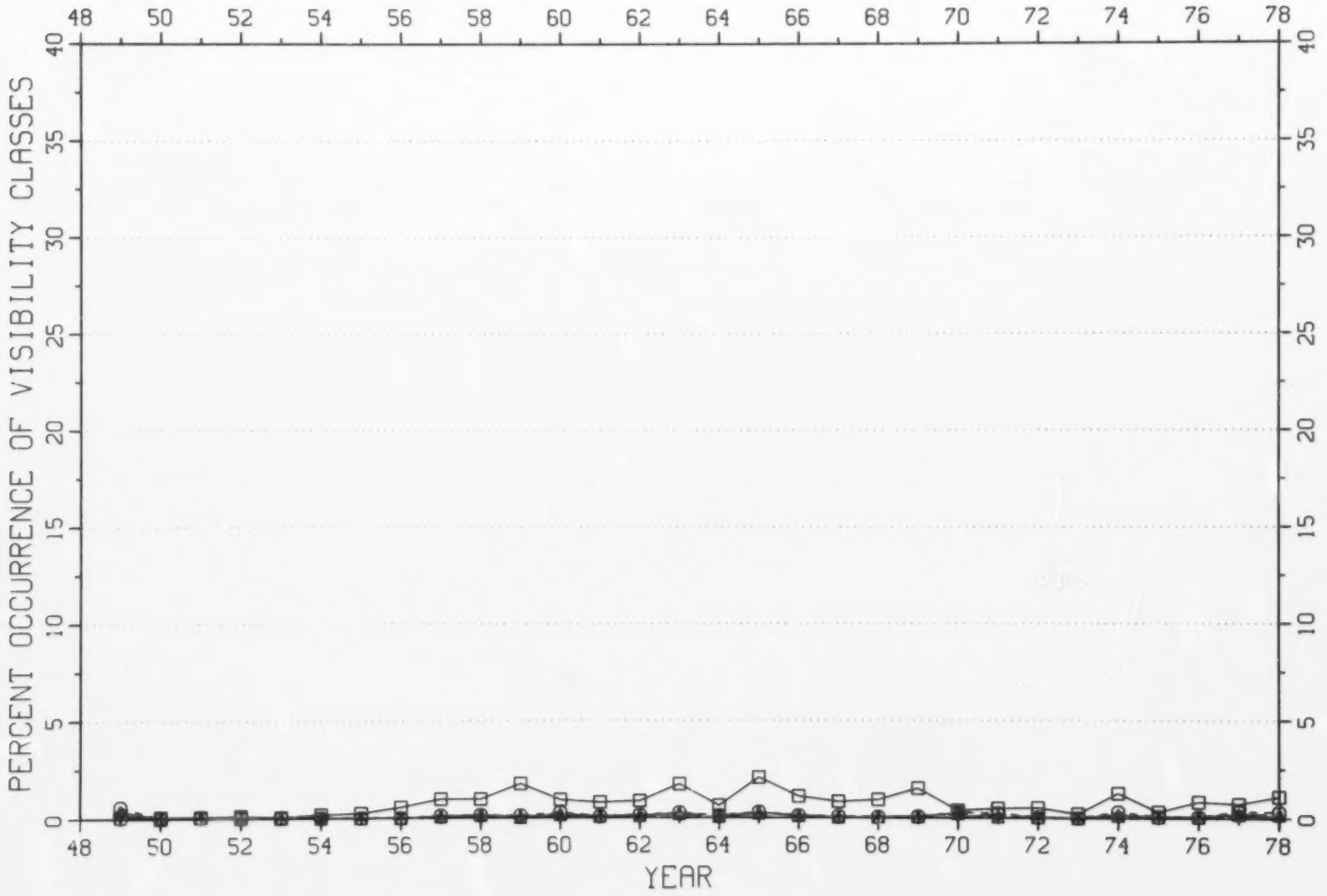

VISIBILITY TIME SERIES FOR DAG DAGGETT, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR DAG DAGGETT, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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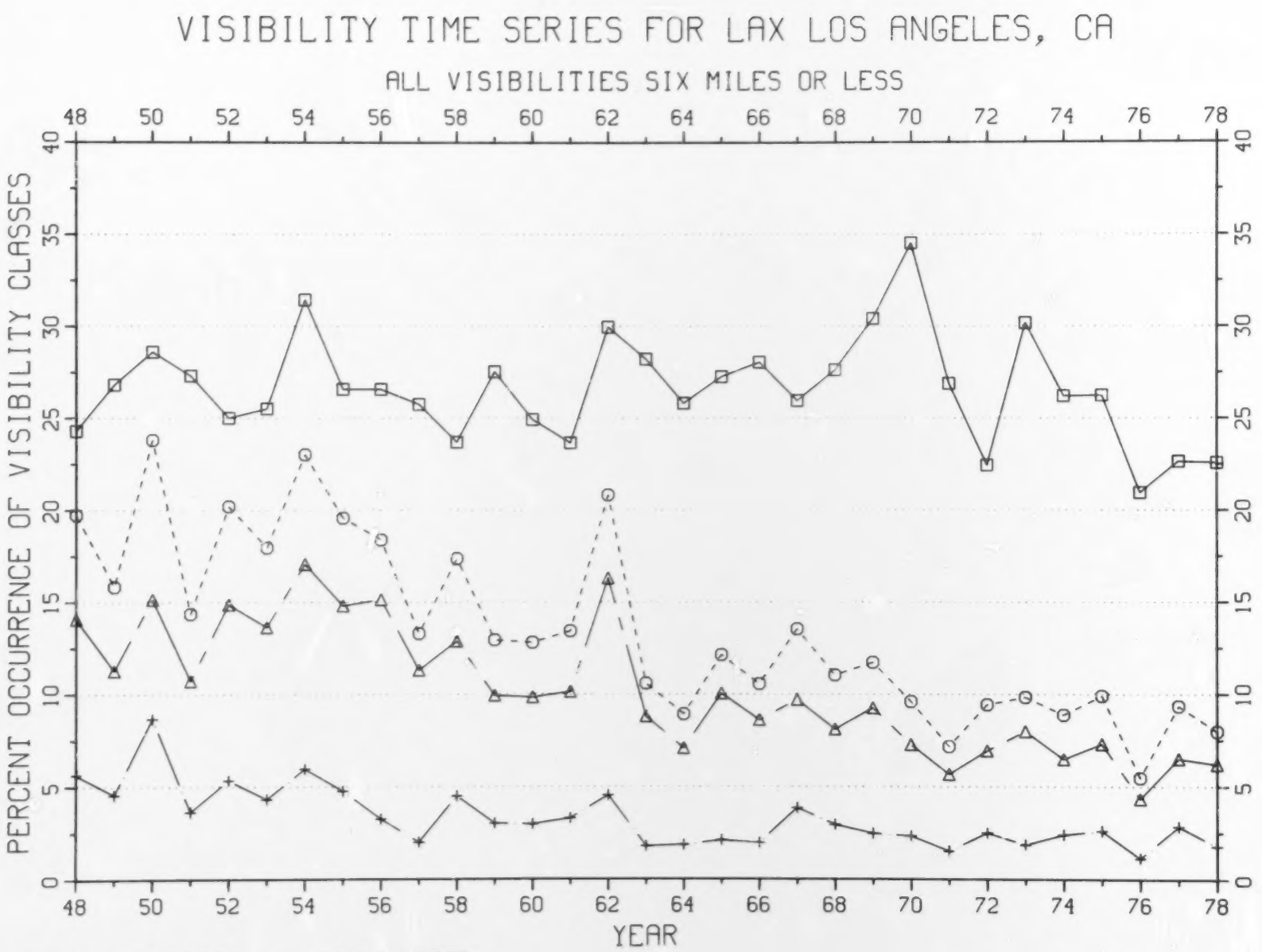
VISIBILITY TIME SERIES FOR LAX LOS ANGELES, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
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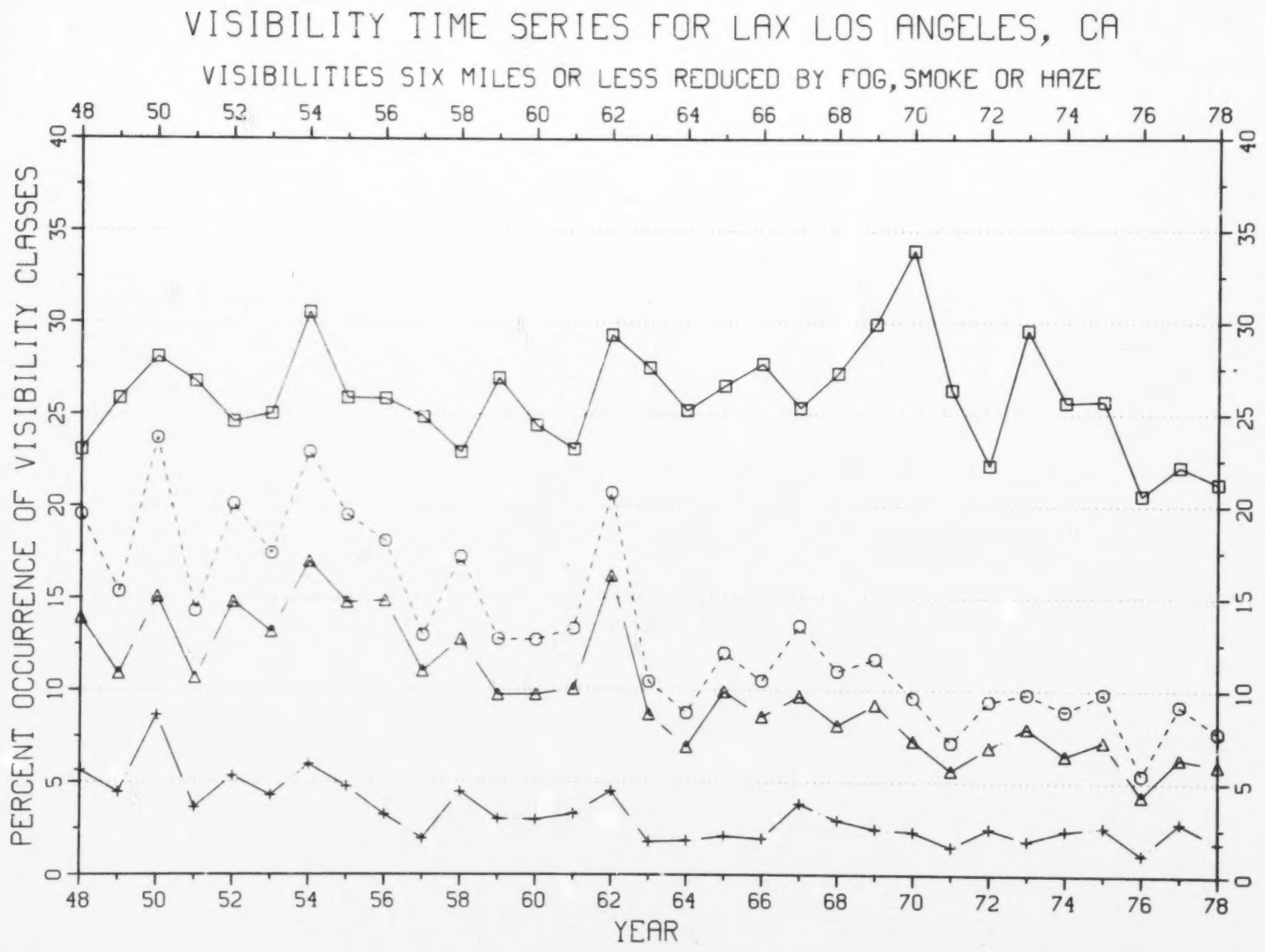
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE



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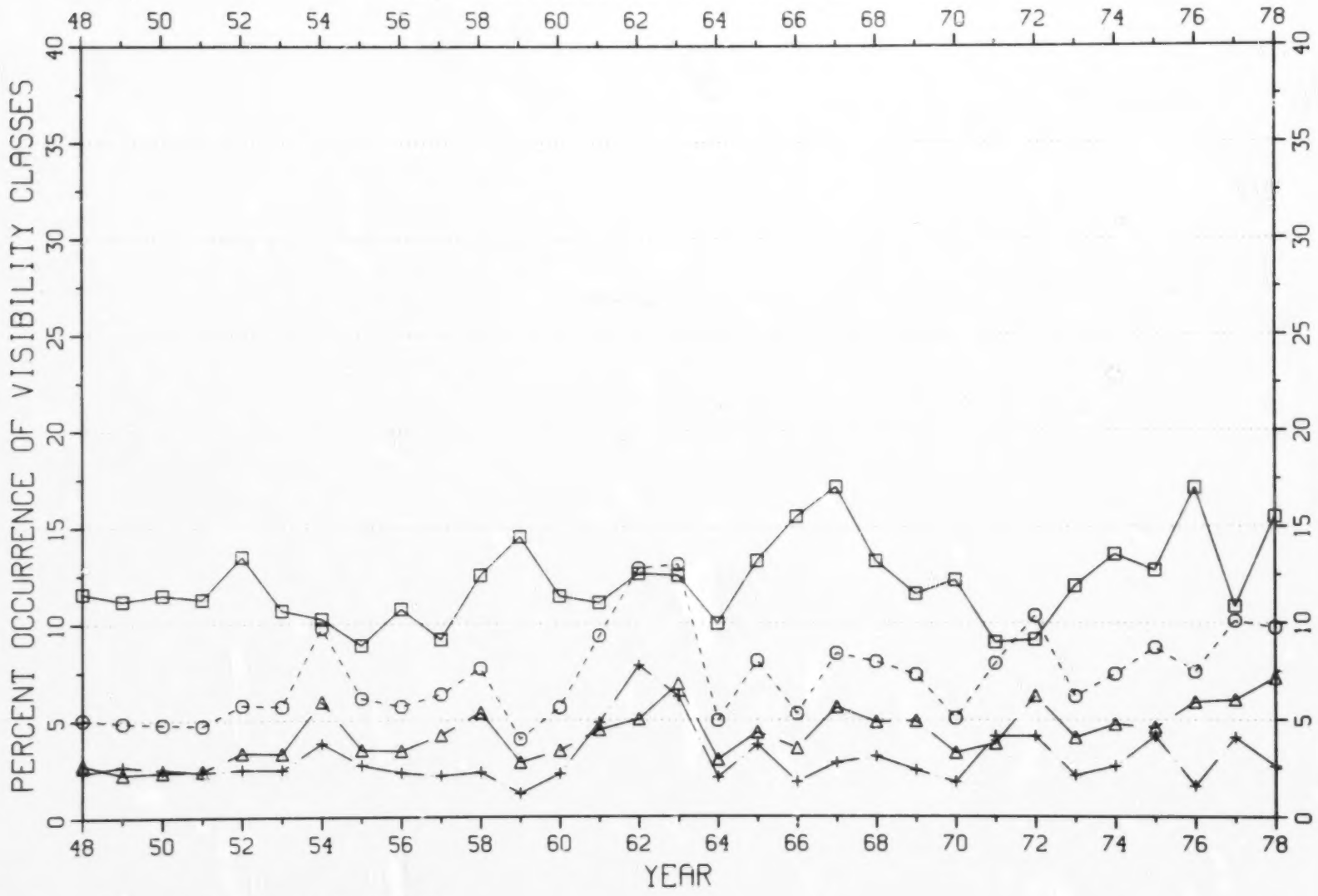
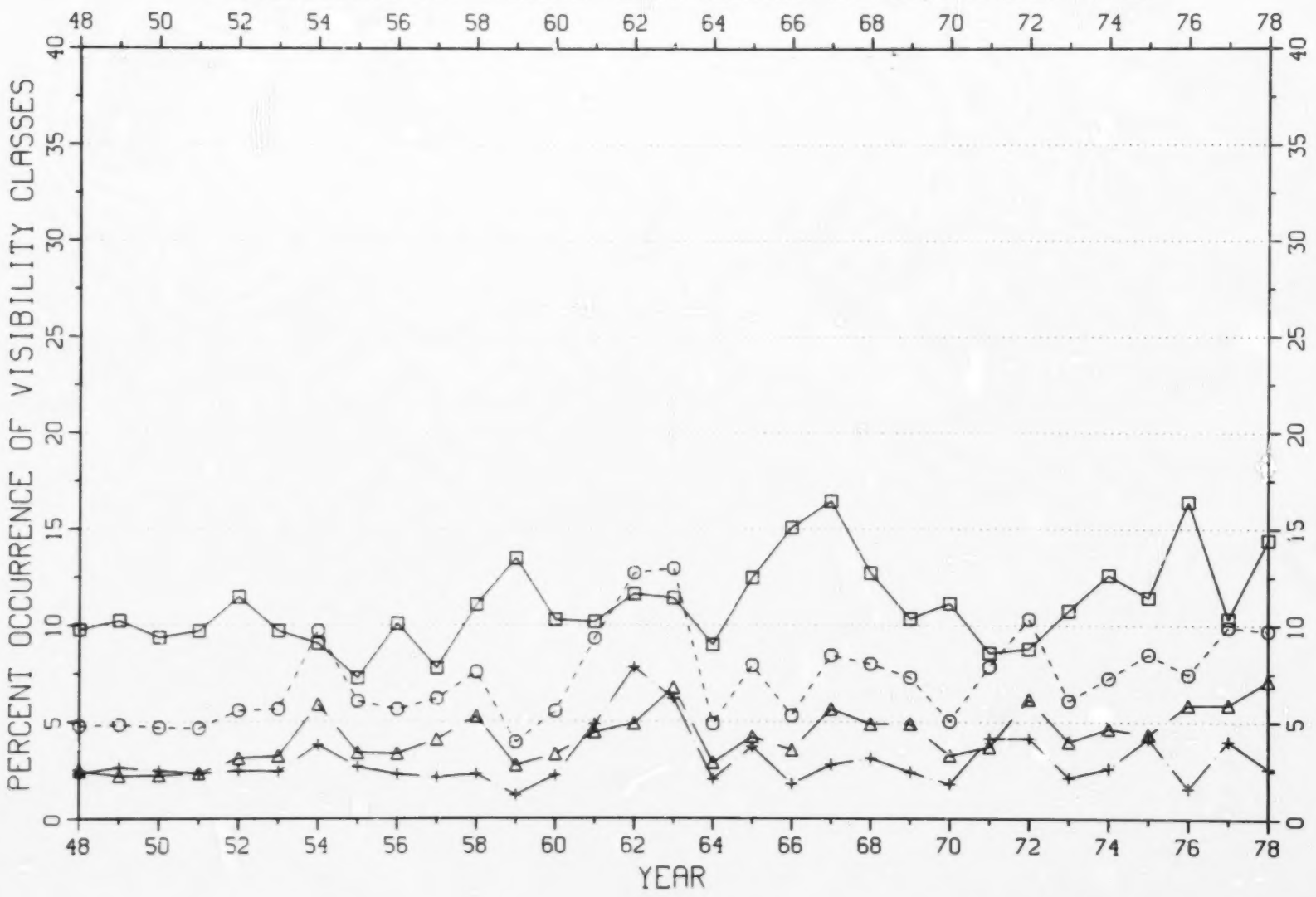

VISIBILITY TIME SERIES FOR SAC SACRAMENTO, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR SAC SACRAMENTO, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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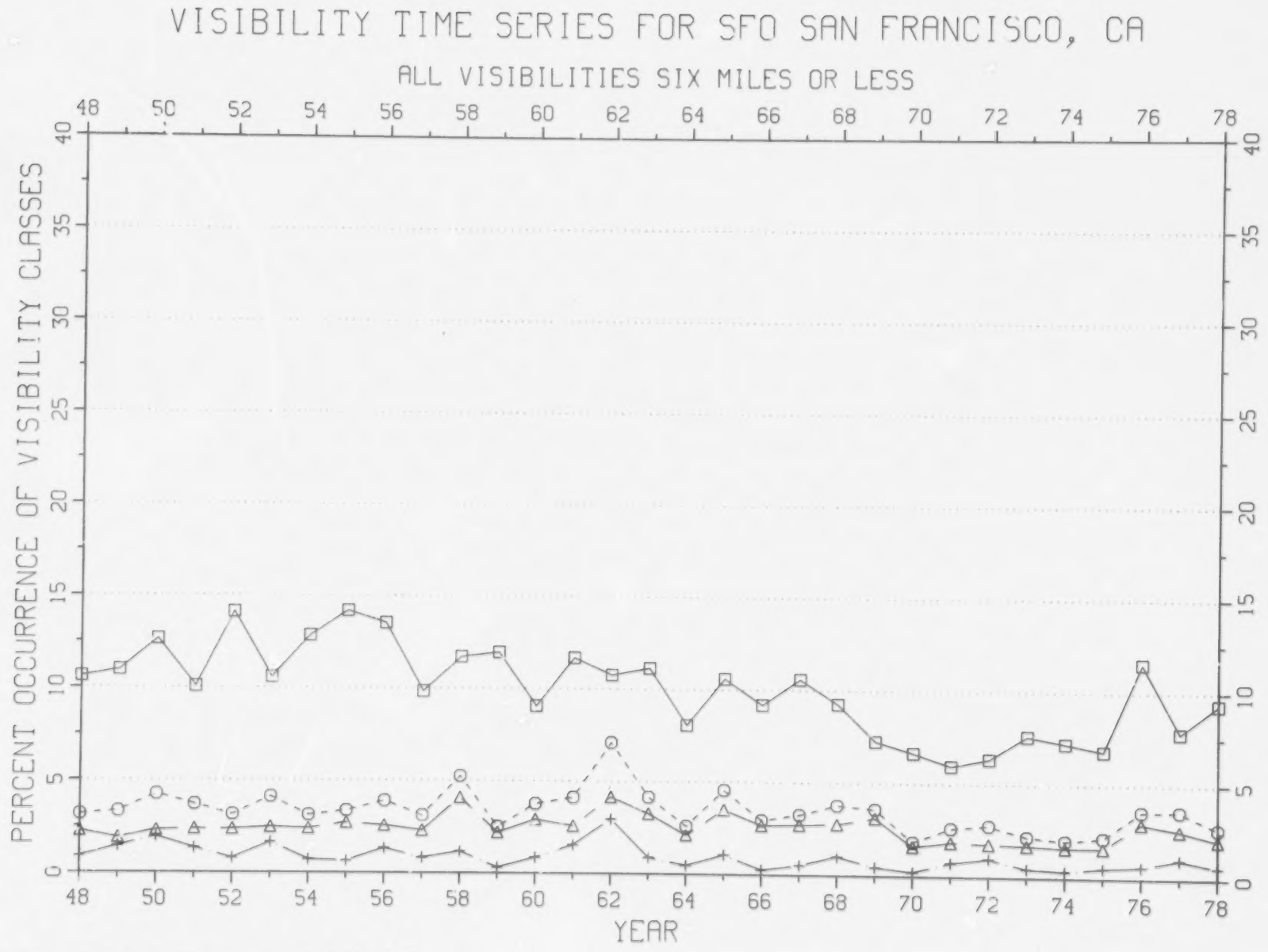
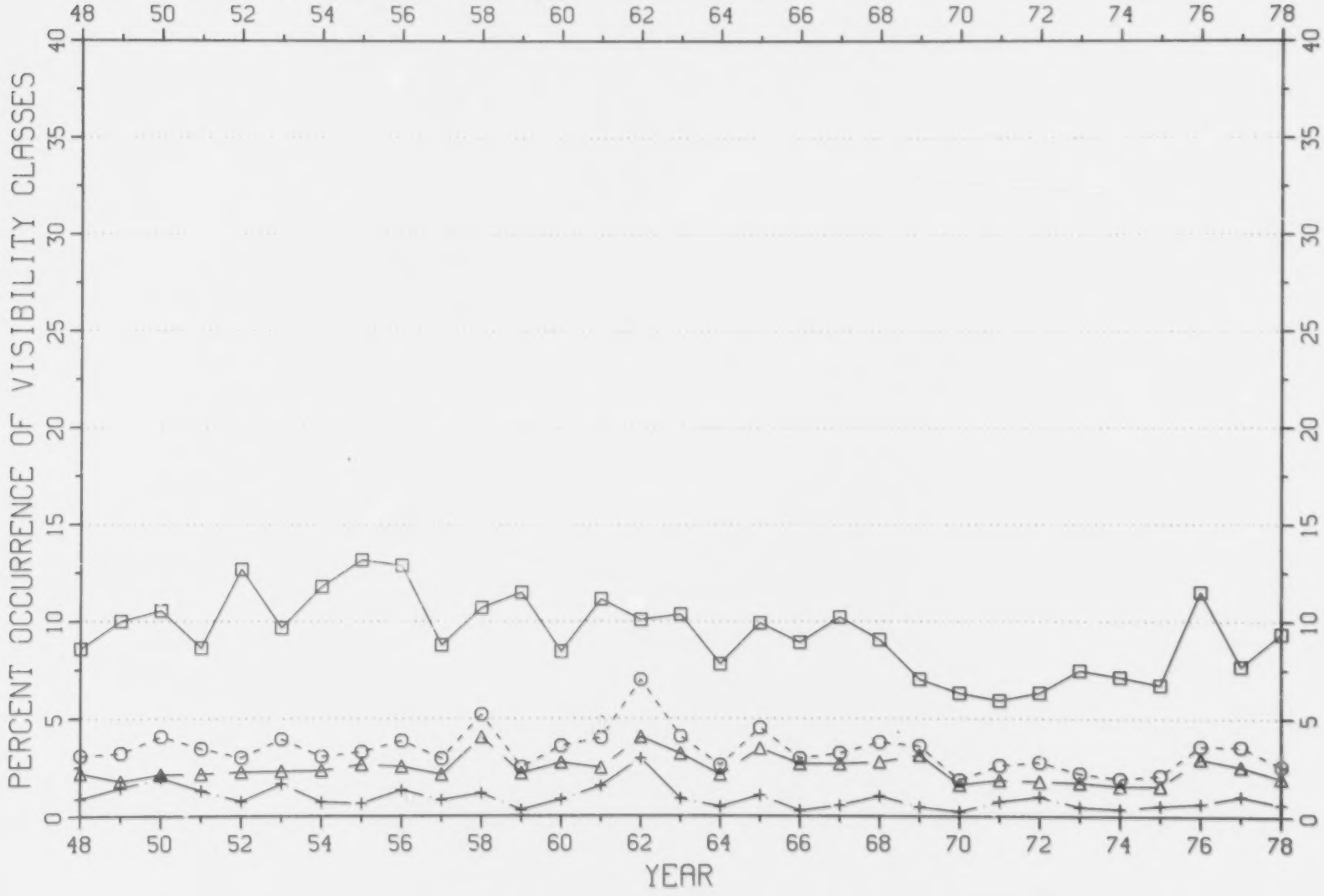

VISIBILITY TIME SERIES FOR SFO SAN FRANCISCO, CA
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR SFO SAN FRANCISCO, CA

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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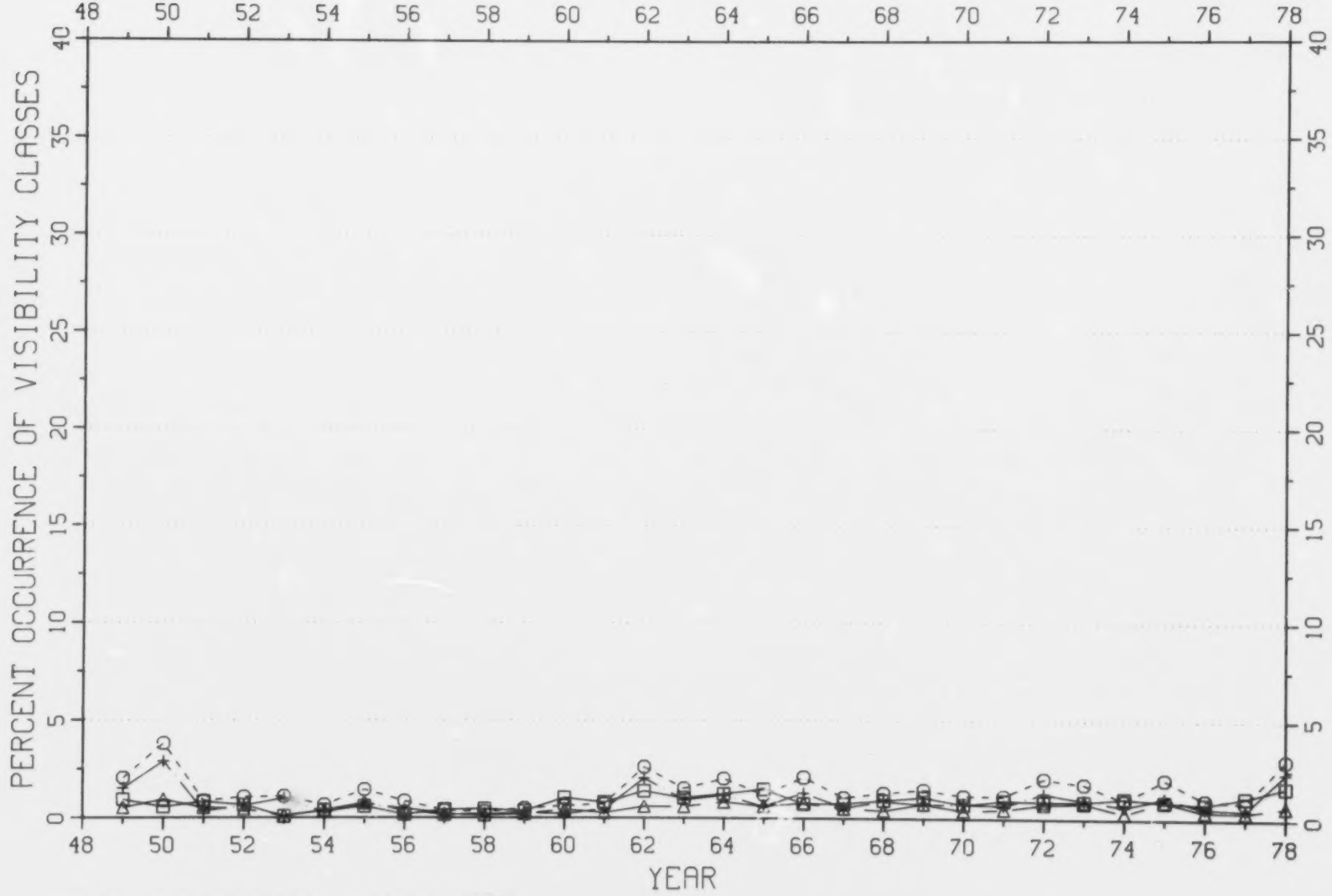
VISIBILITY TIME SERIES FOR LOL LOVELOCK, NV

ALL VISIBILITIES SIX MILES OR LESS



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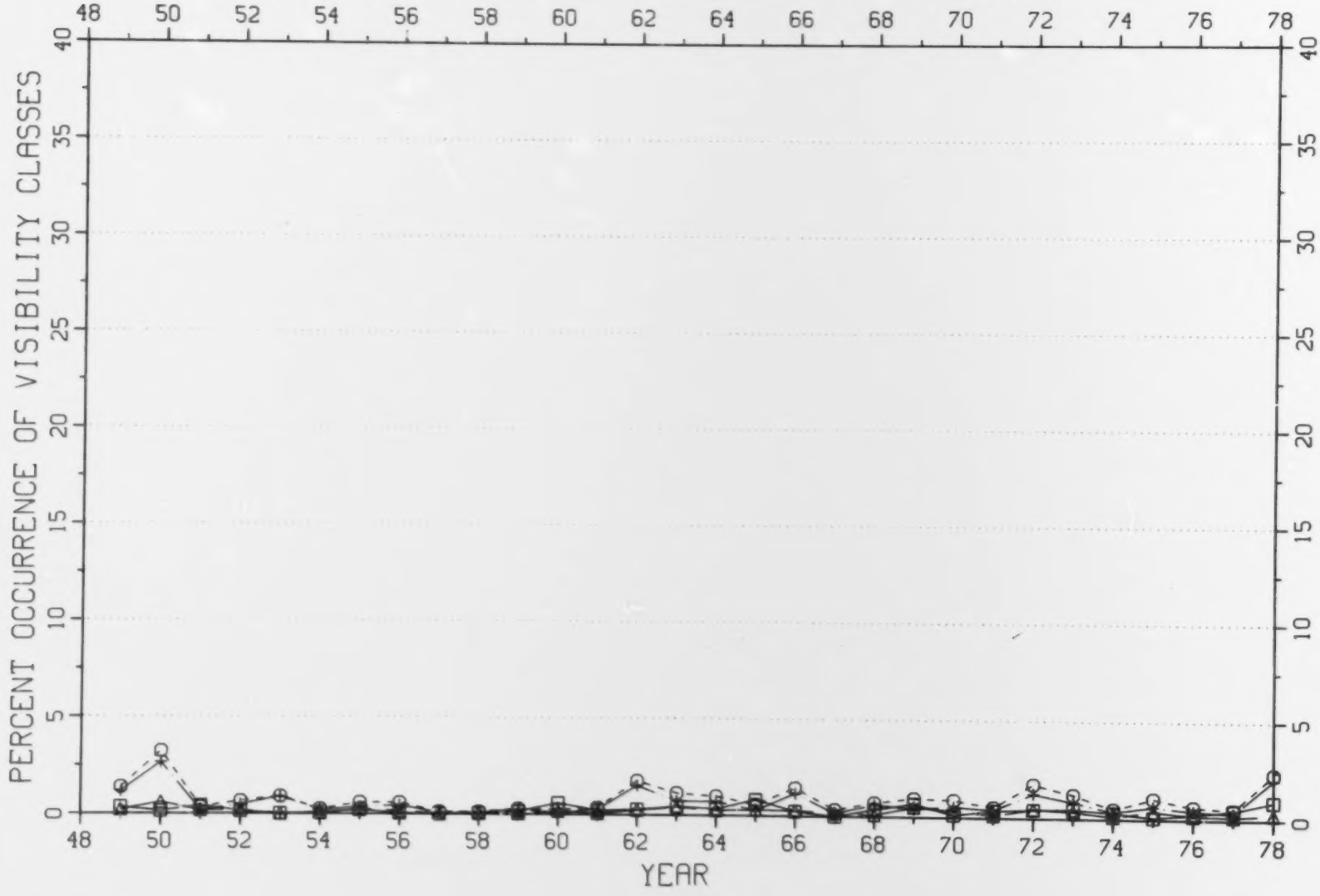
VISIBILITY TIME SERIES FOR LOL LOVELOCK, NV

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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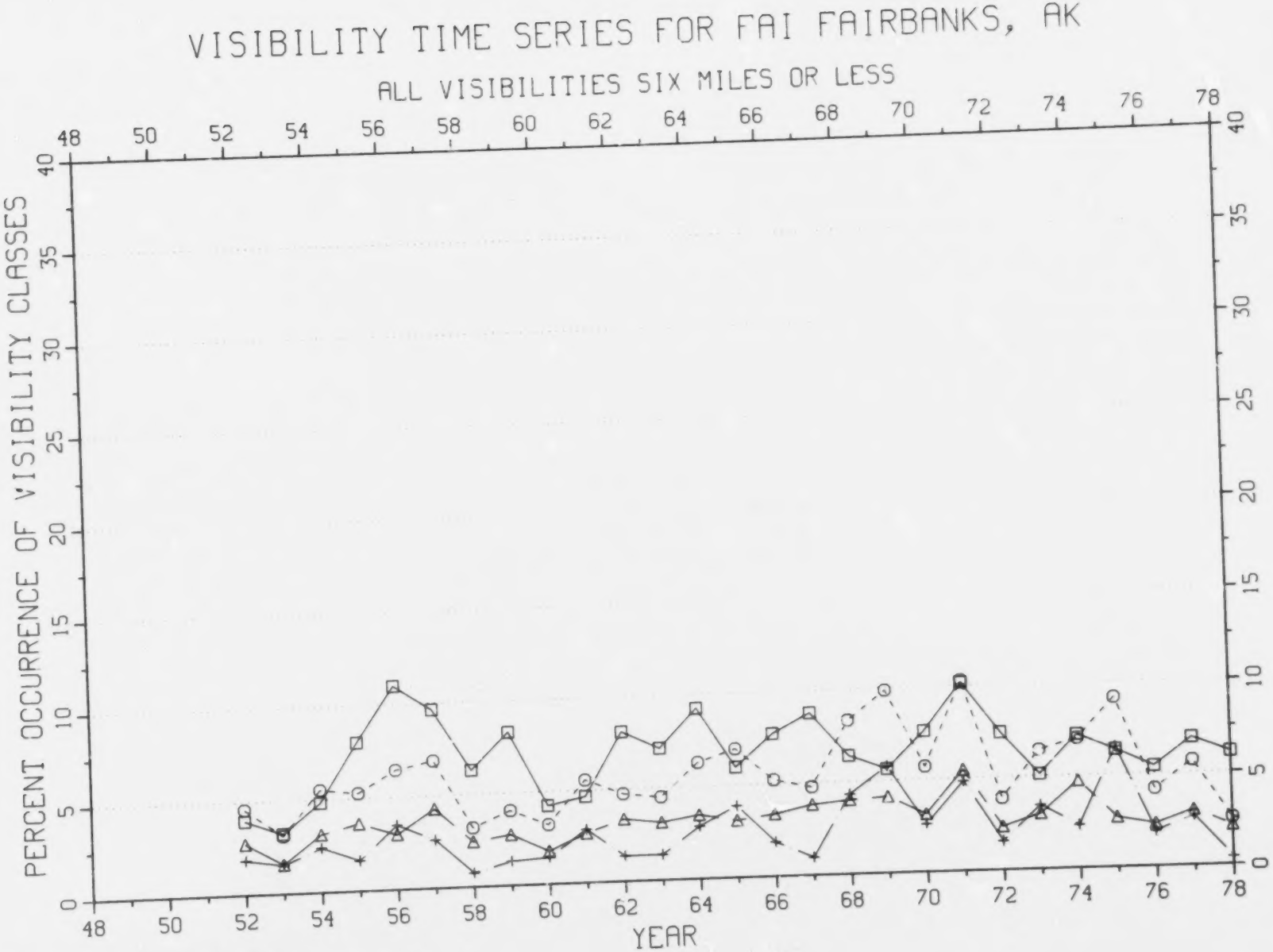
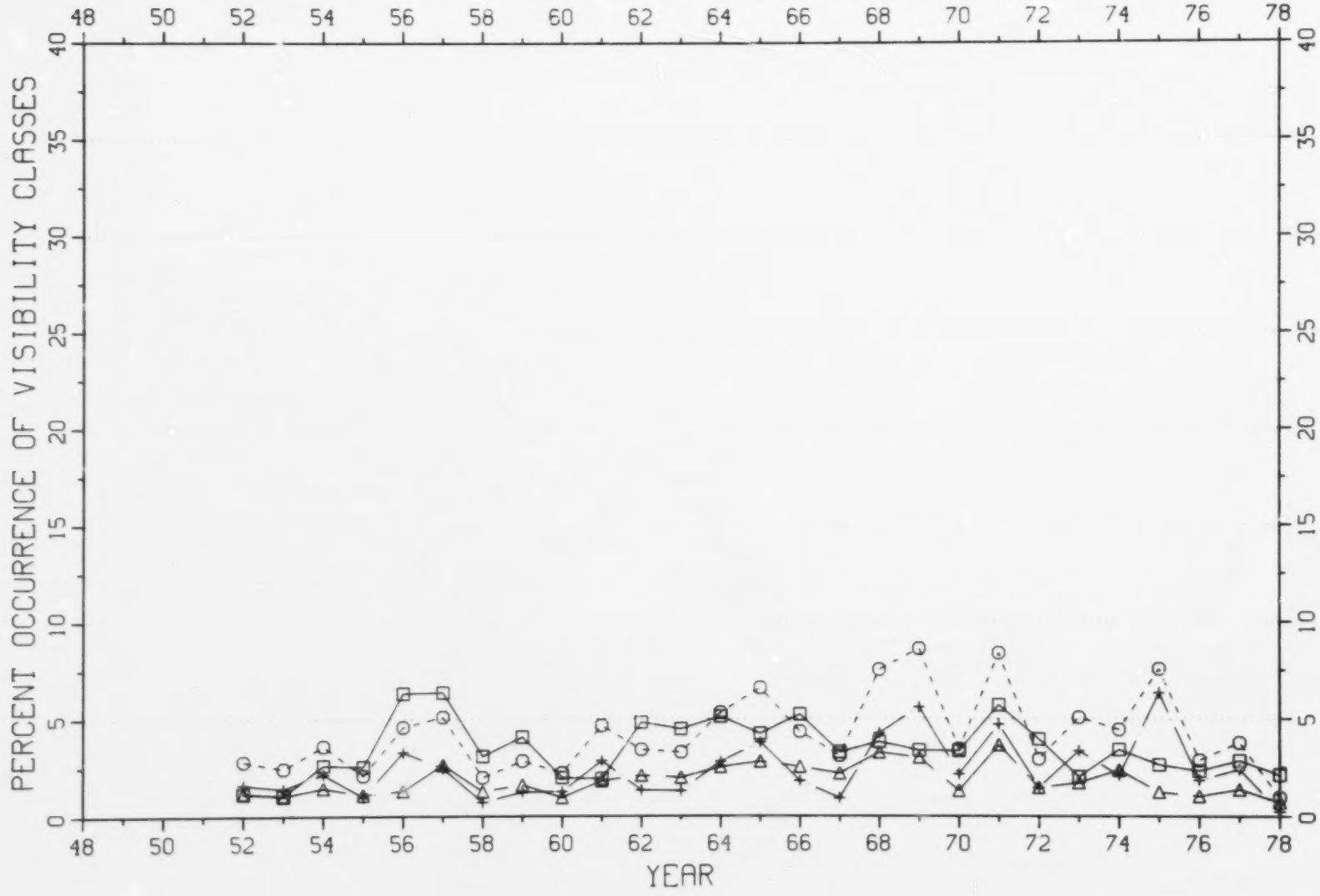

VISIBILITY TIME SERIES FOR FAI FAIRBANKS, AK
ALL VISIBILITIES SIX MILES OR LESS
PERCENT OCCURRENCE OF VISIBILITY CLASSES
YEAR
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
0 5 10 15 20 25 30 35 40

BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR FAI FAIRBANKS, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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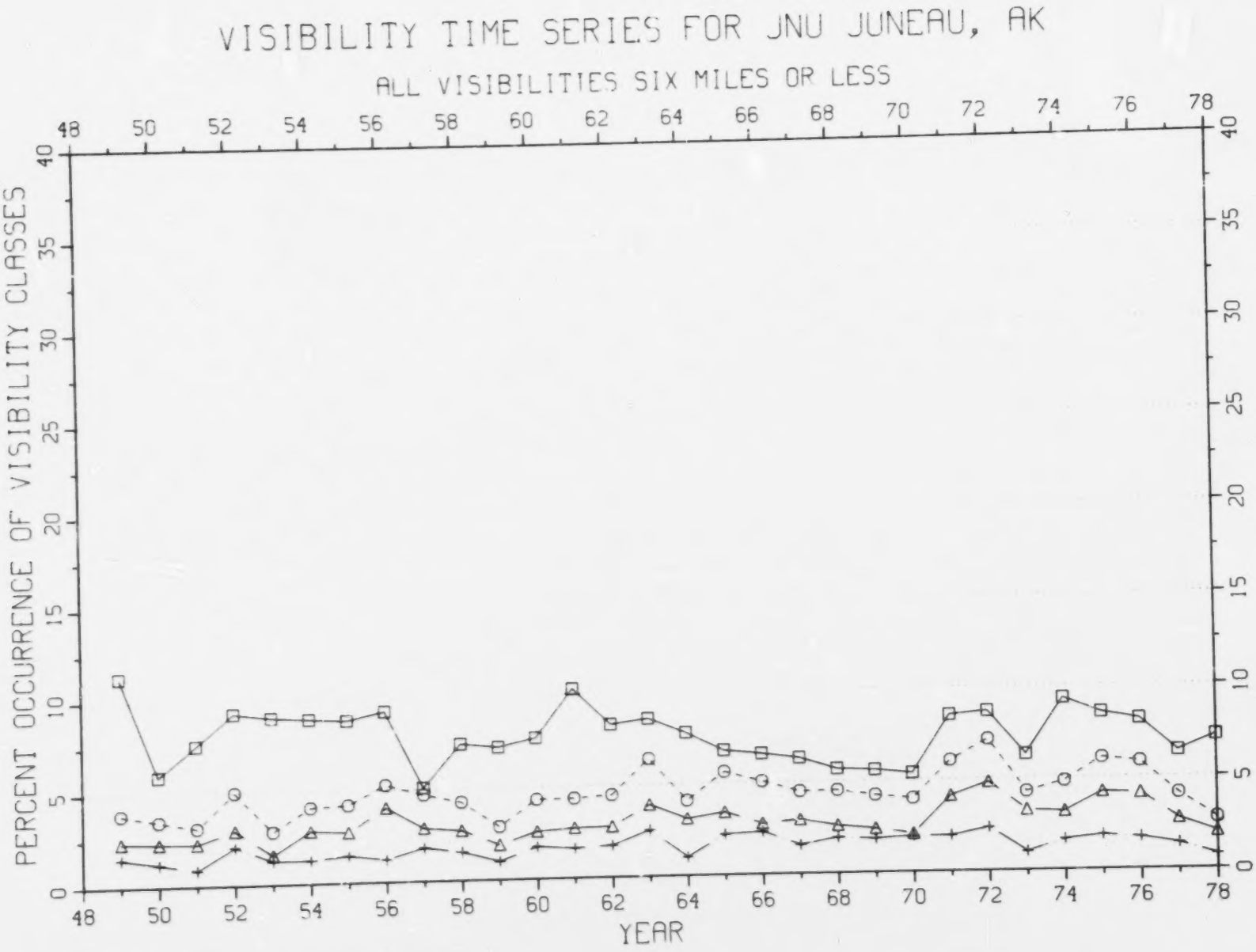

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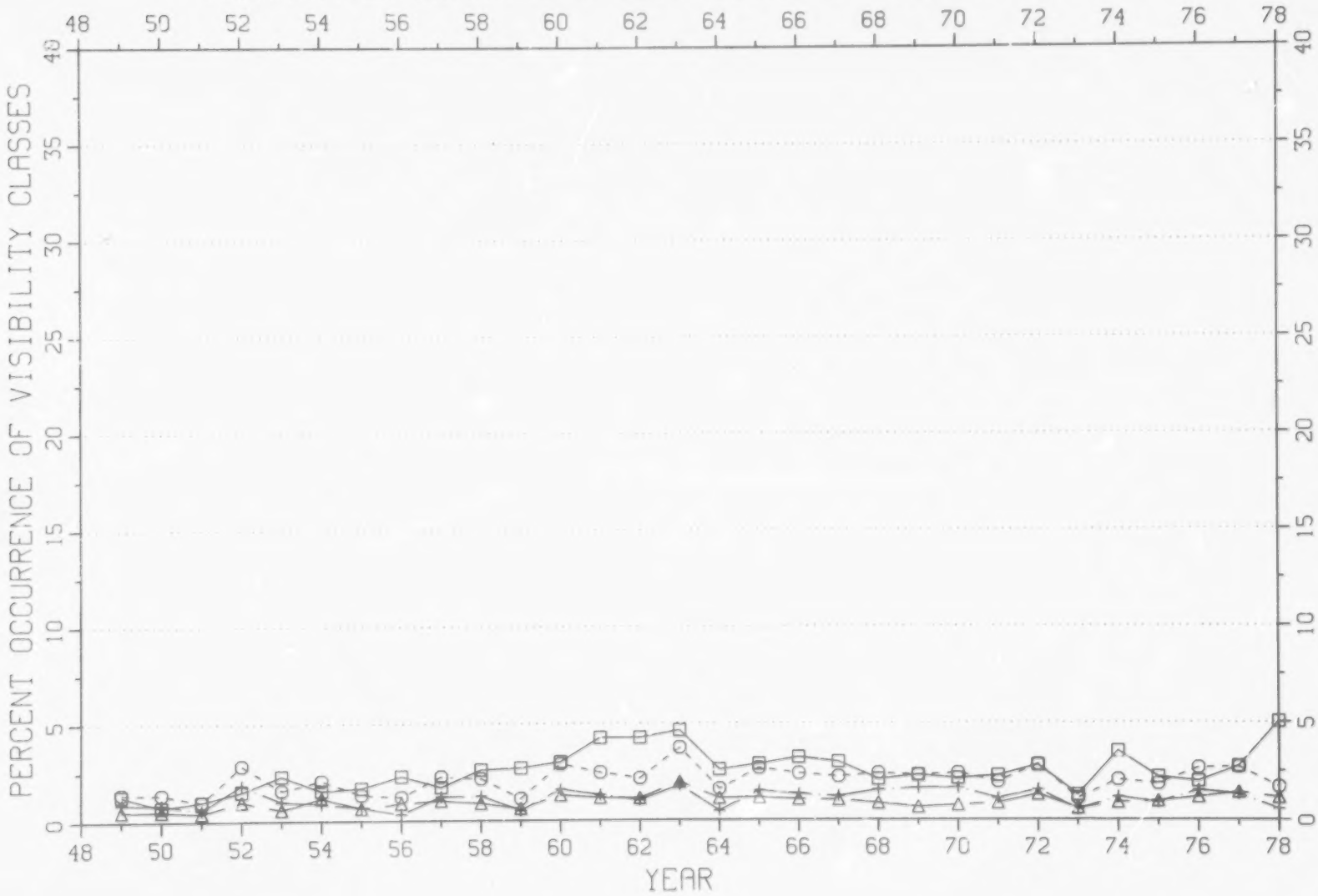
VISIBILITY TIME SERIES FOR JNU JUNEAU, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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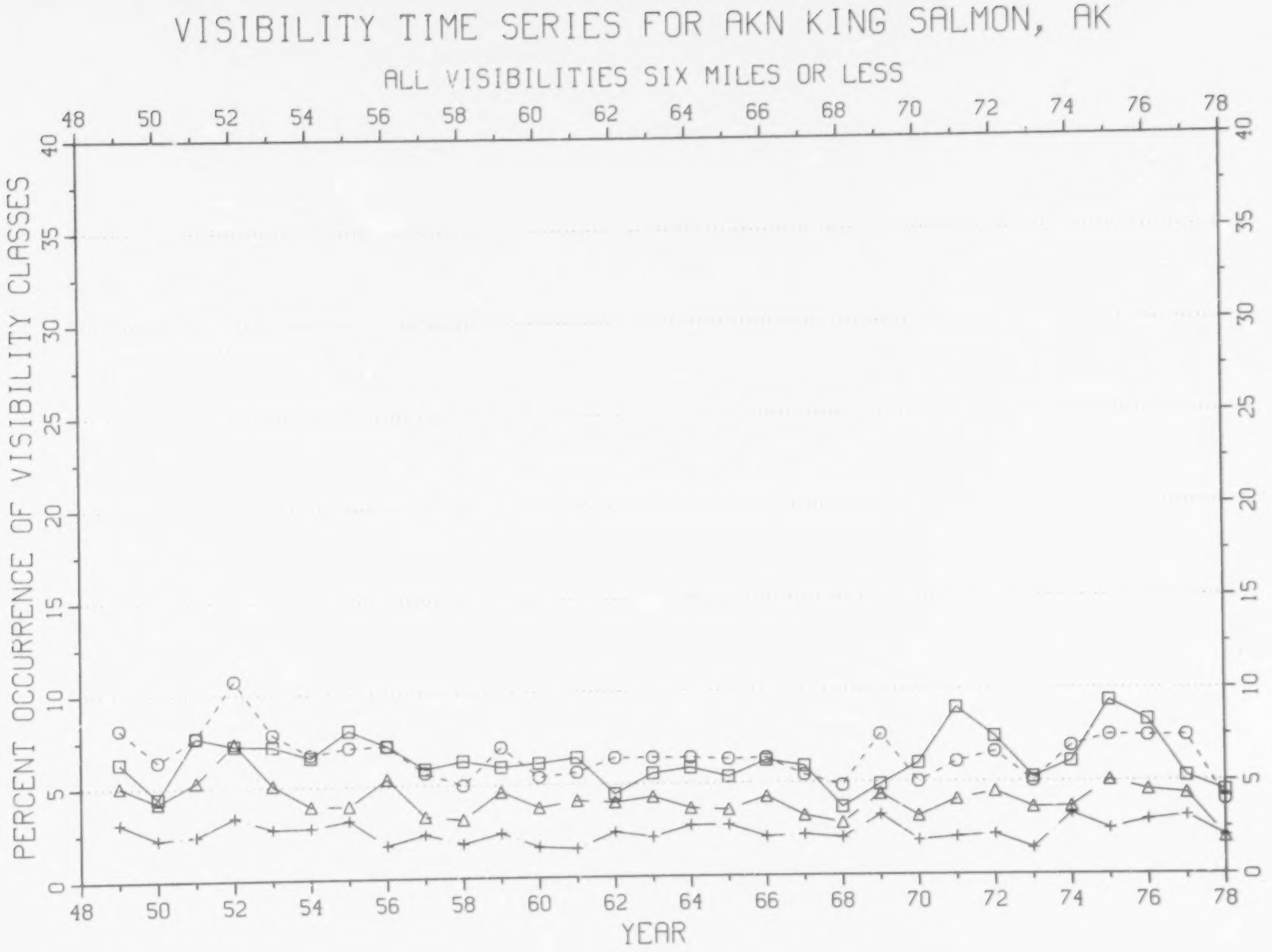

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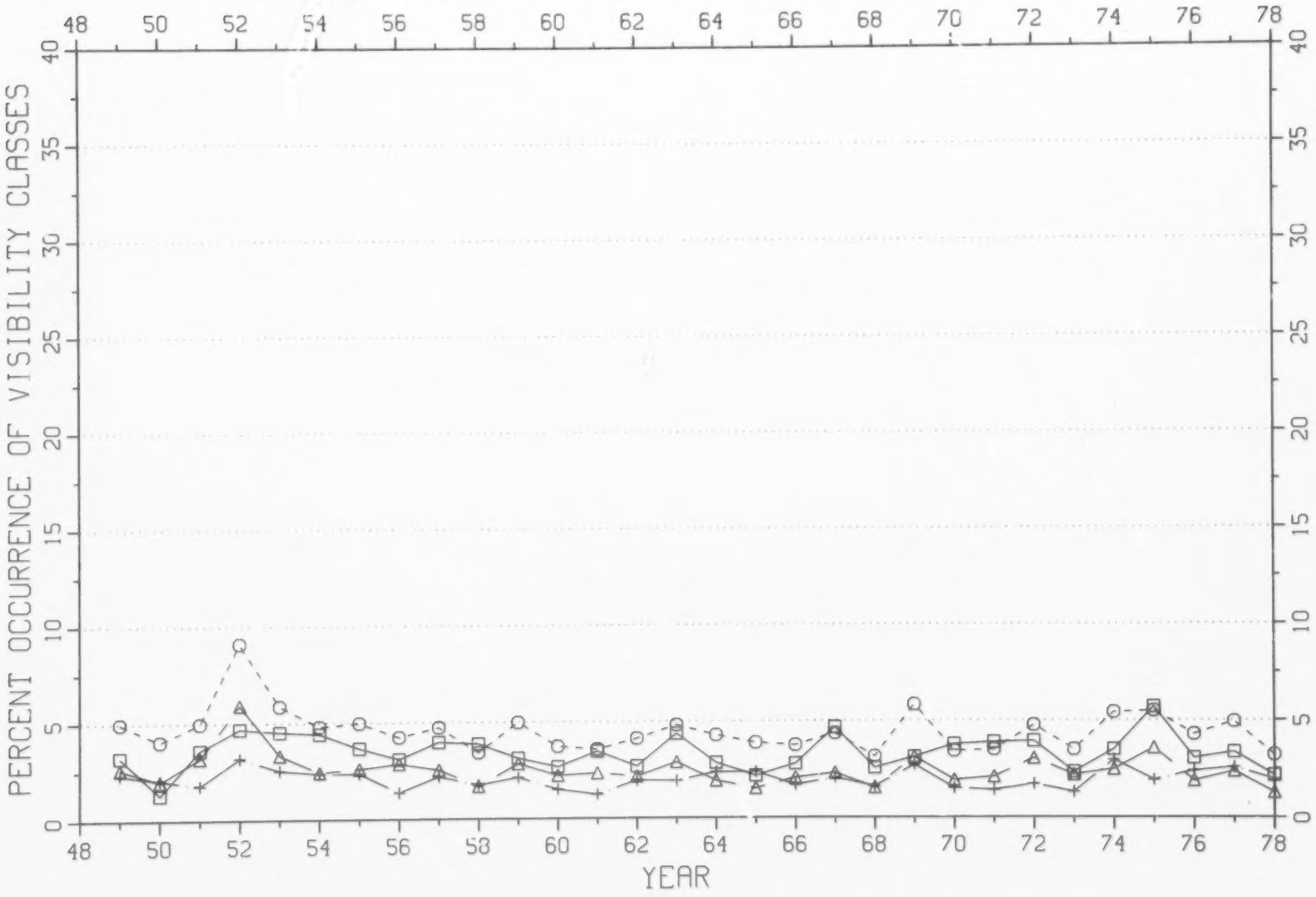
VISIBILITY TIME SERIES FOR AKN KING SALMON, AK

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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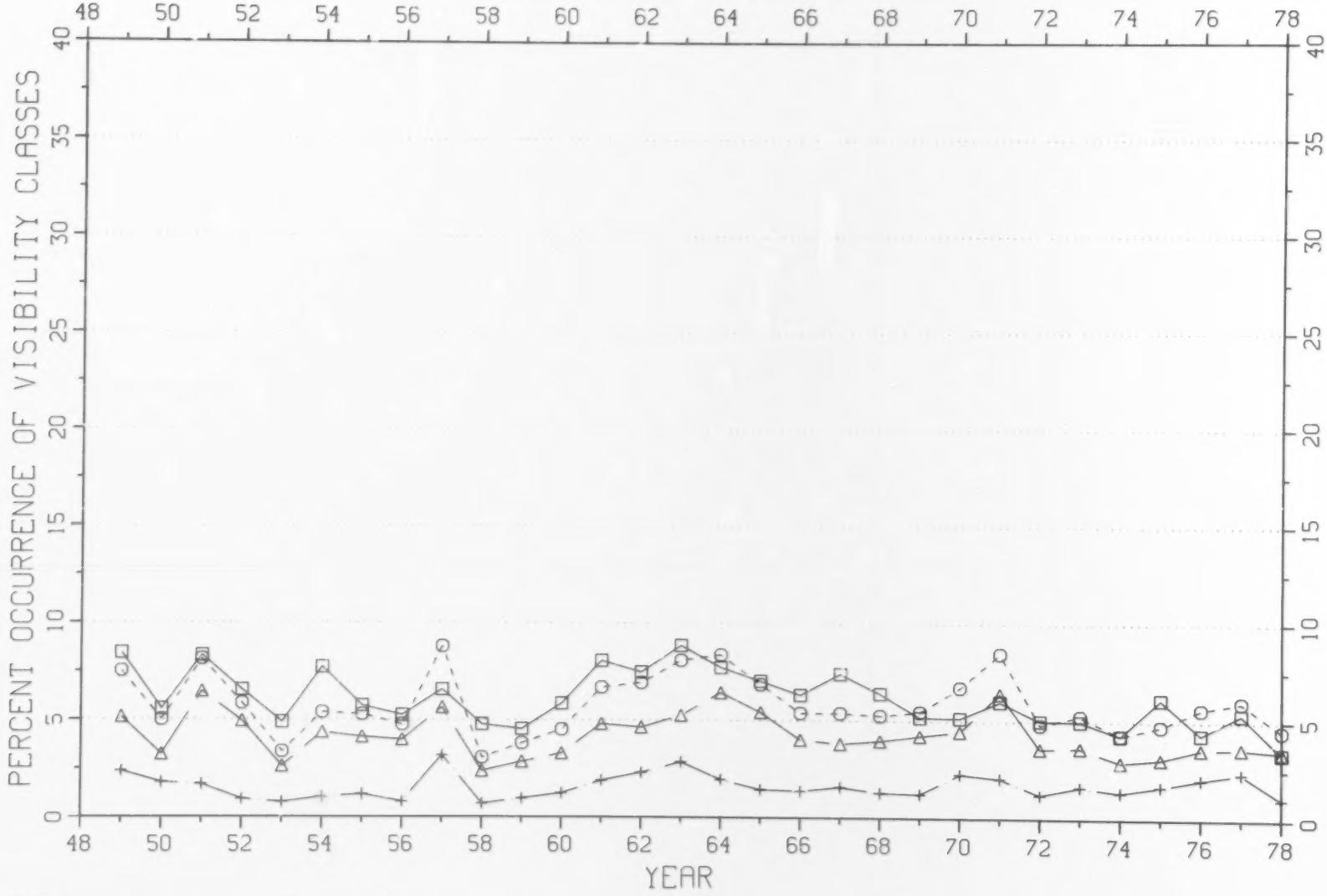
VISIBILITY TIME SERIES FOR MCG MCGRATH, AK

ALL VISIBILITIES SIX MILES OR LESS



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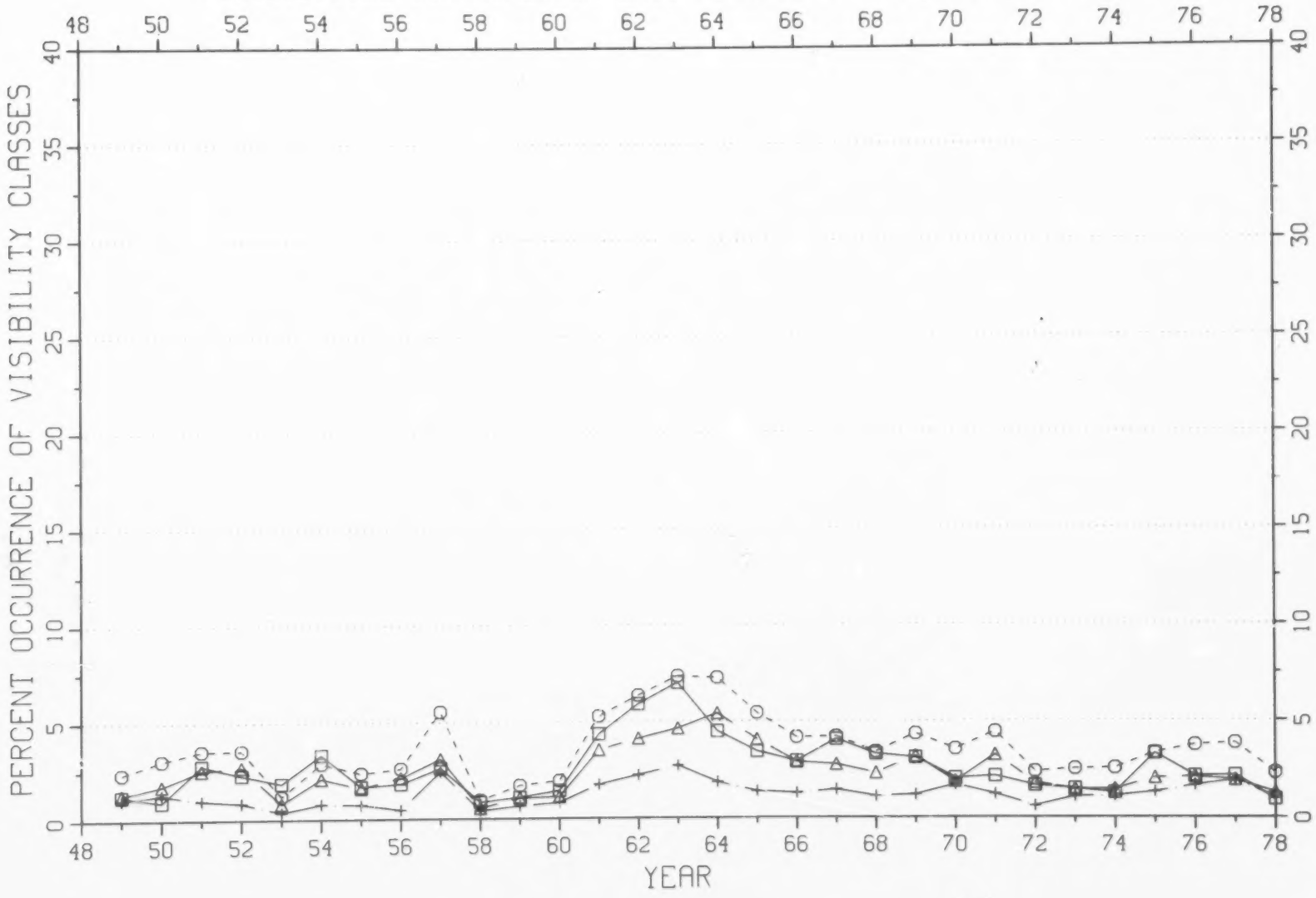
VISIBILITY TIME SERIES FOR MCG MCGRATH, AK

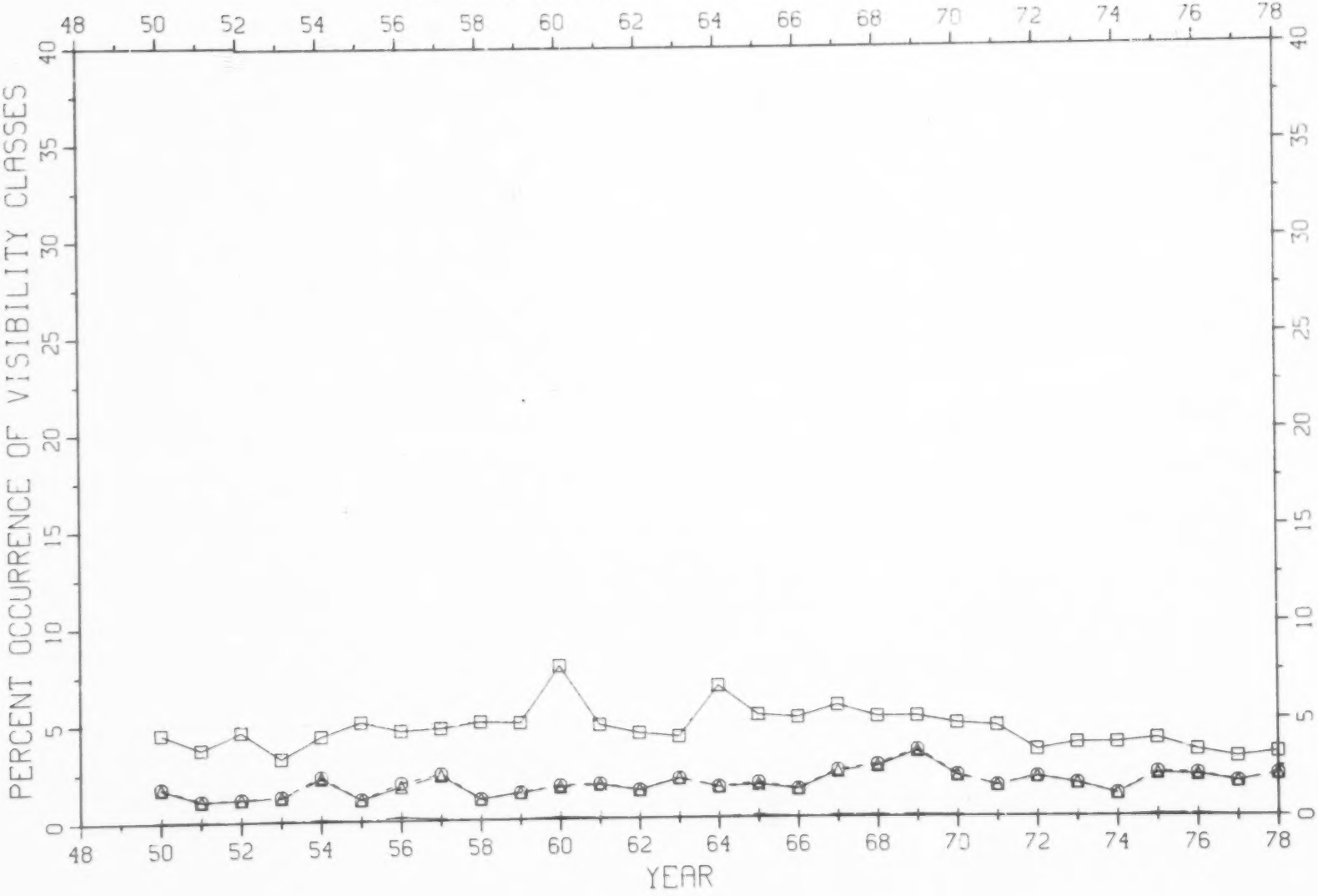
VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



BEST DOCUMENT AVAILABLE

VISIBILITY TIME SREIES FOR ITO HILO, HI

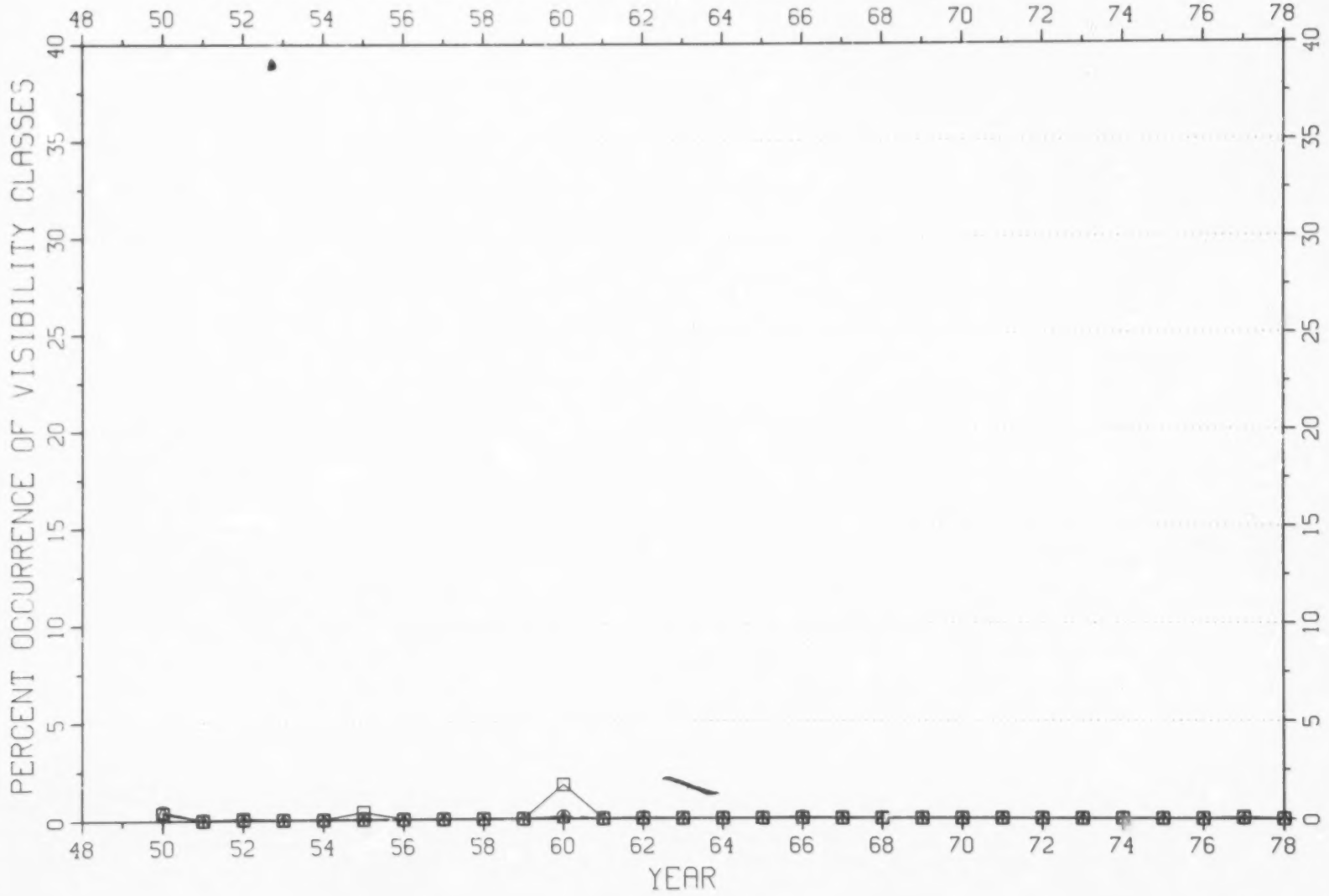
ALL VISIBILITIES SIX MILES OR LESS



BEST DOCUMENT AVAILABLE

VISIBILITY TIME SERIES FOR ITO HILO, HI

VISIBILITIES SIX MILES OR LESS REDUCED BY FOG, SMOKE OR HAZE



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BEST DOCUMENT AVAILABLE